MAGNETIC STATIONS AND TRAVEL VIEWS

1 Station near La Quiaca Observatory, Argentina
2 Station near Funchal, Madeira Islands
3 River transportation in Madagascar
4 Pack-train, Cuyaba to Goyaz, Brazil
5 Station at Cagigal Observatory, Caracas, Venezuela
6 Station near Arequipa, Peru, with Mt. Misti (20,000 feet) in background

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1927

RESEARCHES OF THE DEPARTMENT OF TERRESTRIAL MAGNETISM

VOLUME VI

LAND MAGNETIC AND ELECTRIC OBSERVATIONS, 1918-1926

MAGNETIC RESULTS, 1921-1926

BY

H. W FISK

MAGNETIC, ATMOSPHERIC-ELECTRIC, AND AURORAL RESULTS, MAUD EXPEDITION, 1918-1925

BY

H U. SVERDRUP

PUBLISHED BY THE CARNEGIE INSTITUTION OF WASHINGTON

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LAND MAGNETIC AND ELECTRIC OBSERVATIONS, 1918-1926

By H. W. Fisk and H. U. Sverdrup

LAND MAGNETIC AND ELECTRIC OBSERVATIONS, 1918-1926

INTRODUCTION

This publication is the sixth of the series by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, bearing the general title "Researches of the Department of Terrestrial Magnetism."

The results of magnetic observations made at land stations are given in Volumes I, II, and IV, and are continued in the present publication. Magnetic and atmospheric electric observations made at sea aboard the *Galilee* and, later, on the cruises of the *Carnegie* are published in Volumes III and V. Reports on special researches and constructive work of the Department heretofore published in the series are indicated in the following brief synopsis of contents:

Volume I "Land Magnetic Observations, 1905 1910," contains the data obtained at stations from the beginning of the Department's field work in February 1905 to the end of December 1910.

Volume II "Land Magnetic Observations, 1911 1913, and Reports on Special Researches," contains the results of all magnetic observations made on land during the three years, January 1, 1911, to December 31, 1913. The titles of the special reports are: Research Buildings of Department of Terrestrial Magnetism, by L. A. Bauer and J. A. Fleming; Magnetic Inspection Trip and Observations during Total Solar Eclipse of April 28, 1911, at Manua, Samoa, by L. A. Bauer; Results of Comparisons of Magnetic Standards, 1905 1914, by L. A. Bauer and J. A. Fleming.

Volume III "Ocean Magnetic Observations, 1905 1916, and Reports on Special Researches," presents the final ocean magnetic data obtained aboard the *Galilee* in the Pacific Ocean, 1905 1908, and aboard the *Carnegie* in the Atlantic, Indian, and Pacific Oceans, 1909 1914, together with the preliminary data from observations made during 1915 to 1916 on the *Carnegie's* Cruise IV. The special reports are: Results of Atmospheric-Electric Observations made aboard the *Galilee* (1907 1908), and the *Carnegie* (1909 1916), by L. A. Bauer and W. F. G. Swann; Some Discussions of the Ocean Magnetic Work, by L. A. Bauer and W. J. Peters.

Volume IV "Land Magnetic Observations, 1914 1920, and Special Reports" contains the results of all magnetic observations made on land during January 1, 1914, to December 31, 1920. The authors and titles of the special reports are: J. A. Fleming, Construction of Non-Magnetic Experiment Building of the Department of Terrestrial Magnetism, H. W. Fisk, Dip-Needle Errors Arising from Minute Pivot Defects; S. J. Barnett, A Sine Galvanometer for Determining in Absolute Measure the Horizontal Intensity of the Earth's Magnetic Field; J. A. Fleming, Results of Comparisons of Magnetic Standards, 1915 1921.

Volume V "Ocean Magnetic and Electric Observations, 1915 1921," presents, besides the main section on the work of the *Carnegie*, (1) Magnetic Results, by J. P. Ault, (2) Atmospheric-Electric Results, by J. P. Ault and S. J. Mauchly,

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SUMMARY OF LAND WORK, 1905 1926

Much of the material here published in final form has been supplied in manuscript to establishments engaged in preparation of magnetic charts or geographic maps, and to various organizations interested for industrial or commercial purposes in the results of the surveys conducted by the Department. In addition, it has been a pleasure to forward to local officials in places where our observers have been the magnetic data applying to the immediate locality in return for the assistance which these persons have courteously accorded the Department in its work. In these ways the immediate needs of the public have, to a considerable degree, been met in advance of final publication.

The general magnetic survey of the globe, to the accomplishment of which the Carnegie Institution of Washington, through its Department of Terrestrial Magnetism, devoted its energies for many years, has been completed for the major part of the Earth. While this task has been accomplished largely through the labors of the Department, these were directed chiefly to the ocean areas and to those countries or regions for which magnetic data would not otherwise be obtained promptly. In some regions, required magnetic surveys were accomplished by cooperation with existing organizations or with interested investigators. Valuable data in polar regions have been obtained by successful cooperation with the Peary Arctic Expedition, the Mawson Antarctic Expedition, the Amundsen Arctic expeditions, and the Baffin Land and North Greenland expeditions of Dr. Donald B. MacMillan.

The observers whose reports appear in this volume have for the most part been concerned with securing secular-variation data by the reoccupation of magnetic stations established by previous observers. It has been found practicable also to visit a few regions not hitherto reached in a course of earlier surveys, for example, certain portions of the interior of Brazil, the island of Madagascar, the Bahama Islands, and regions covered by arctic expeditions. Thus, at the end of 1926, repeat stations fairly well distributed for purposes of secular-variation discussion had been occupied in the general region of the South Pacific, in Australia and New Zealand, over all of Central America and South America, throughout the West Indies, and in parts of Africa including Morocco, West Africa from the mouth of the Niger to Lake Tchad, and portions of East Africa.

Summaries of the numbers of stations occupied in each country and main geographical division have been given in preceding volumes, intended to convey a general idea of the extent of the operations of the Department and at the same time to indicate approximately the density of distribution of the places at which observations have been made in the several regions. With the growth of the work, the accumulation of reoccupations of varying degrees of exactness, and with the

change in the character of the program [illegible] from year to year have to considerable extent [illegible] Accordingly, a new enumeration has been made [illegible] in each of the main geographic divisions [illegible] represented by the four volumes in which the results of land [illegible]

Table 1 gives such a summary of the [illegible] 1905 to 1926. It differs in some small detail with [illegible] for Volumes I, II, and IV as given in corresponding [illegible] conform with the finally adopted method of enumeration [illegible]

[illegible]

Geographical Division	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Africa	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Asia[b]	[illegible]	[illegible]	[illegible]			
Australasia	[illegible]	[illegible]		[illegible]	[illegible]	
Europe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
North America	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
South America	[illegible]	[illegible]		[illegible]		
Islands						
Atlantic	[illegible]	[illegible]		[illegible]		
Indian	[illegible]	[illegible]			[illegible]	
Mediterranean	[illegible]	[illegible]		[illegible]		
Pacific	[illegible]	[illegible]				
Antarctic Regions		[illegible]				
Totals	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]

[a] Including [illegible]
[b] Including stations occupied by the [illegible]
[c] Including 41 stations occupied by the [illegible]
[d] Not including 41 stations [illegible]

During 1921 to 1926 less attention has been given [illegible] of magnetic distribution, and more has been devoted [illegible] information relating to the annual change in the magnetic elements. [illegible] enumeration of stations no longer fully represents either the extent of the Department's operations or the density of distribution of the [illegible] have been made in any region. It often occurs that all the [illegible] large country or subdivision are grouped within one or two [illegible] mere statement of the numbers of stations does not properly represent the [illegible] points useful for secular variation discussion. As explained [illegible] auxiliary stations are frequently established in important [illegible] value of the work done, and it is desirable to make an enumeration [illegible] of this kind under a separate heading.

In order to summarize the work and to take into account the changed conditions, a number of new descriptive designations have been introduced, [illegible] "locality," "occupation," "reoccupation," "auxiliary station," [illegible]

tion," "repeat-locality." That the table may be properly interpreted, these are each defined below

Station This designation refers to any position of an instrument used in magnetic observations and which, in regions of great local disturbance, may be displaced with reference to another station by but a short distance, either horizontally or vertically. A station is designated "primary" when all three magnetic elements are determined, except in certain cases as outlined below.

Locality No fixed rule can be laid down with reference to the distance between stations regarded as being in the same locality, and each case is decided according to conditions. In general, a locality is not taken so large that the value of any element changing normally would have appreciably different values at opposite limits. The limits for a "proximate" reoccupation have been taken as 5 kilometers, and thus stations as much as 5 kilometers (3 miles) apart are regarded as being in separate localities. In regions of known local disturbance, as, for example, in Bermuda, much narrower limits necessarily are taken.

Occupation A visit of an observer to a locality for making observations is considered an occupation, whether a complete or only a partial program of observations has been carried out. Where more than one observer constitutes the party, only one occupation is enumerated, but where the observers, traveling as separate parties, reach a locality at or about the same time, the number of occupations is the number of parties making the observations. For example, when the party from the *Carnegie* and a field observer reach a station simultaneously, two occupations are counted.

Reoccupation An occupation of a locality previously occupied by a C. I. W. observer or party is considered a reoccupation. It has not been possible to include a classification for the reoccupation of stations established by observers of other organizations, although the number of these constitutes a large and valuable source of the available secular-variation data. When an observer returns to a locality which he has himself occupied, it is regarded as reoccupation only in case other distant localities have been occupied in the interval in general not less than one month. Exceptions to this rule are made in the case of base-stations, winter-quarters in the polar regions, observatory sites, and other semipermanent stations, where observations are made intermittently over long periods. Such stations are counted as repeat stations (see definition below), but the number of reoccupations is limited according to circumstances. At permanent observatories, the Washington Standardizing Magnetic Observatory, and the Watheroo and Huancayo magnetic observatories, each year's work is counted as a reoccupation, a wholly arbitrary rule, but reasonable, since secular-change data result. Visits to these observatories by field parties for comparison of instruments are not regarded as reoccupations. The limitations with regard to the number of observers or parties are the same as for an occupation.

Auxiliary station Whenever an observer makes observations at more than one station in a locality at the same visit, an extra station is counted, and these are classified as auxiliary and secondary. An auxiliary station is an extra station at

which all three elements have been observed. [illegible] different positions are used for the determination of the [illegible] these are combined so as to provide one [illegible]

Secondary station. Stations employed for the determination [illegible] of the elements are classed as secondary stations [illegible] observatories where two or more piers are provided for [illegible] meter and inclinometer, and in a few [illegible] divided the program, using different stations for magnetometer [illegible] earth inductor. If, however, the same element [illegible] and H at one and D and I at the other [illegible] recorded.

Secondary locality. No use has been made of the [illegible] small in number, at which the observer [illegible] all elements. An occupation [illegible] station is enumerated.

Repeat locality. Reoccupations are exact, close [illegible] according to the distance of the new station from the former. [illegible] is regarded as exact when close enough to employ the [illegible] muths without appreciable error, close when within 30 [illegible] within 300 meters, and proximate when at a greater distance up to [illegible] to the limit regarded as defining the locality.

Table 2 summarizes all of the Department's land results for the [illegible] by geographical divisions, including station occupations under [illegible] and number of repeat localities and repeat occupations.

TABLE 2. *Summary of land [illegible]*

Geographical division	Station occupations: Primary	Auxiliary	[illegible]	Repeat [illegible]: [illegible]	[illegible]
Africa	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Asia[1]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Australasia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Europe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
North America	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
South America	[illegible]	117	[illegible]	[illegible]	[illegible]
Islands				[illegible]	[illegible]
Atlantic	154	115	47	[illegible]	[illegible]
Indian	94	10	[illegible]	[illegible]	[illegible]
Mediterranean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pacific	186	46	[illegible]	[illegible]	[illegible]
Antarctic regions	26	[illegible]	[illegible]	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total station-occupations					[illegible]

[1]Including stations occupied by the *Maud* in the Arctic Sea off the coast of Siberia.

SECULAR-VARIATION STATIONS

The distribution of the secular-variation data now available from the observations of the Department only is shown in detail in Table 3, in which the name of each locality and the number of times it has been occupied are given. Under the heading "Continent" in the first column are given the names of the main geographical divisions, which include island groups as well as continents according to the classification used throughout the volume. In the second column, headed "Country," the name of the subdivision appears under which, in some instances, as, for example, in the West Indies and Central America, a number of countries are grouped as a matter of convenience. Under the heading "Repeat-localities and occupations" the name of each locality appears in the form adopted in the Table of Results and elsewhere in this and preceding volumes. Following the name of the locality, a number is given which shows the occupations according to the definitions adopted in the preceding section. The totals for each country appear in the final columns, while a grand total is given at the end of each main geographic division or continent.

Table 3. Details Regarding Repeat Localities and Occupations for Determination of Magnetic Secular Variation, 1905-1926

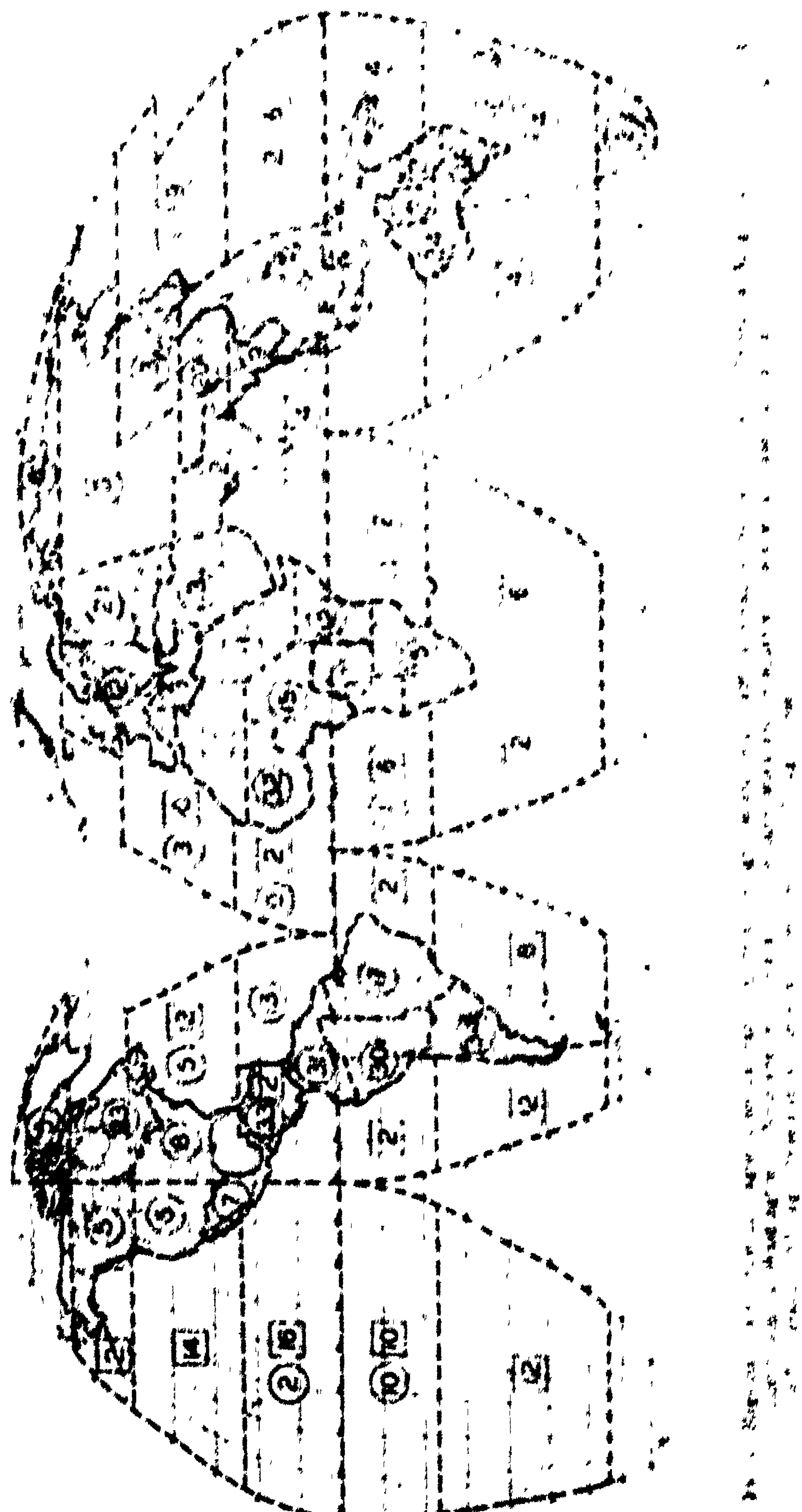
Continent	Country	Repeat localities and occupations	Totals: Localities	Totals: Occupations
Africa	Abyssinia	Addis Abeba, 2, Dire Dawa, 2, Hawash, 2	3	6
	Algeria	Algiers, 4, Oran, 2	2	6
	Algerian Sahara	Touggourt, 2	1	2
	Anglo-Egyptian Sudan	Port Sudan, 3	1	3
	Angola	Benguela, 2, Caconda, 2, Cassualala, 2, Huambo, 2; Loanda, 4, Lobito, 2, Malange, 2, Mossamedes, 2, Ninguari, 2	9	20
	Belgian Congo	Banana, 2, Bololo, 2, Boma, 3, Elisabethville, 2, Kambove, 2, Leopoldville, 2, Matadi, 2, Ruwe, 2	8	17
	British South and Central Africa	Broken Hill, 2, Cape Town, 3, Grahamstown, 2, Hellerivier, 2, O'okiep, 2, Victoria Falls, 2	6	13
	Cameroon	Duala, 3, Garoua, 3, Olama, 2	3	8
	Egypt	Alexandria, 2, Helwan Observatory, 6, Suez, 5, Tor, 3	4	16
	Eritrea	Asmara, 2, Massaua, 3	2	5
	French Equatorial Africa	Brazzaville, 3, Fort Lamy, 2, Libreville, 2, Port Gentil, 3	4	10
	French Somaliland	Jibuti, 3	1	3
	French West Africa	Abidjan, 2, Ansongo, 2, Bouaké, 2, Bourem, 2, Conakry, 2, Cotonou, 2, Dakar, 2, Gaya, 2, Grand Bassam, 2, Kayes, 2, Koulikoro, 2, Mamou, 2, Matam, 2, Mopti, 2, Niafunké, 2, Niamey, 2, Parakou, 2, Podor, 2, Savé, 2, Segou, 2, St. Louis, 2, Timbuktu, 2	22	44
	Gambia	Bathurst, 2	1	2
	Gold Coast Colony	Accra, 3, Kumasi, 2, Sekondi, 3	3	8
	Kenya Colony	Kisumu (Port Florence), 2, Makindu, 2, Mombasa, 2, Nairobi, 2, Nakuru, 2, Voi, 2	6	12
	Liberia	Cape Palmas, 3, Cuttington, 2, Harper, 2	3	7
	Morocco	Casablanca, 2, Larache, 2, Mogador, 2, Rabat, 2, Tangier, 2	5	10
	Mozambique (Portuguese East Africa)	Chinde, 2; Mopea, 2, Mozambique, 2	3	6
	Nigeria	Amar, 2, Ibi, 2, Jebba, 2, Kano, 3, Lagos, 2, Lokoja, 2; Yola, 2, Zaria, 2	8	17
	Sierra Leone	Bo, 2, Freetown, 3, Moyamba, 2	3	7
	Southwest Africa	Aus, 2, Gibeon, 2, Keetmanshoop, 2, Seeheim, 2, Swakopmund, 2, Windhoek, 2	6	12
	Tanganyika Territory	Dar es Salaam, 2, Kilossa, 2, Ngere Ngere, 2, Tabora, 2	4	8
	Tripolitania	Tripoli, 3	1	3
	Tunisia	Sfax, 2, Tunis, 2	2	4
	Uganda	Gondokoro, 2, Kiriba (Rejaf), 2	2	4
		Totals for Africa	113	253

TABLE 3—*Details Regarding Repeat-Localities and Occupations for Determination of Magnetic Secular-Variation, 1905–1926*—Continued

Continent	Country	Repeat-localities and occupations	Totals Localities	Totals Occupations
Asia	Arabia	Aden, 6, Jidda, 3	2	9
	Asiatic Russia	Ayon Island (Winter-Quarters 1919–20), 2, Bear Island (Winter-Quarters 1924–25), 2, Cape Serdze Kamen (Winter-Quarters 1920–21), 2, Kain-ge-skon, 3, No 35 (68 N and 165 E), 2, Winter-Quarters 1918–19, 2	6	13
	China	Amoy, 2, Canton, 14, Chengchang, 2, Chengchow, 4, Chinchowfu, 2, Chinkiang, 2, Chuanchow, 2, Foochow, 2, Hangchow, 2, Hankow, 3, Hengchow, 2, Hongkong, 8, Ichang, 2, Kalgan, 2, Kiukiang, 2, Lanchowfu, 2, Liangchowfu, 2, Lukiapang, 2, Mengtsz, 2, Nanchang, 3, Nanking, 2, Newchwang, 2, Ningpo, 2, Peking 1907, 4, Peking 1916, 2, Pingfan, 2, Shanhaikwan, 2, Shiuchow, 2, Sianfu, 2, Soochow, 2, Swatow, 2, Tientsin, 2, Tsinan, 2, Wuchow, 3, Wuhu, 2, Yochow, 2, Yunnanfu, 2, Zikawei, 2	38	101
	India	Alibag, 2, Dehra Dun, 2	2	4
	Indo-China	Phantiet, 3, Phu Lien, 2, Saigon, 3	3	8
	Japan	Sugita, 2	1	2
	Siberia (see Asiatic Russia)			
	Straits Settlements	Singapore, 3	1	3
	Turkish Empire, including Syria and Palestine	Afiumkarahissar, 2, Aidin, 2, Aleppo, 2, Alexandretta, 2, Basra, 2, Beirut, 2, Damascus, 3, Dardanelles, 2, Homs, 2, Jerusalem, 2, Smyrna, 2	11	23
		Totals for Asia	64	163
Australasia	Australia	Adelaide, 3, Albany, 3, Albury, 2, Ararat, 2, Batchelor, 3, Border Town, 4, Bourke, 2, Brisbane, 3, Broken Hill, 2, Broome, 2, Bunbury, 3, Burra, 2, Cairns, 2, Carnarvon, 2, Coduna, 2, Charleville, 2, Cloncurry, 2, Connel's Creek, 3, Cooktown, 3, Coolgardie, 3, Cordillo Downs, 2, Cottesloe, 10, Croydon, 2, Cunnamulla, 2, Darwin, 3, Derby, 2, Dubbo, 2, East Maitland, 2, Edithburg, 2, Emerald, 2, Eucla, 3, Farina, 3, Forsayth, 2, Geraldton, 2, Goondiwindi, 2, Goulburn, 2, Harden, 2, Hobart, 3, Hughenden, 2, Jericho, 2, Katanning, 2, Katherine River, 3, Latrobe, 2, Lawlers, 2, Leonora, 2, Longford, 2, Mackay, 2, Maree (Hergott Springs), 3, Meekatharra, 2, Melbourne, 7, Menindie, 2, Merredin, 2, Moora, 2, Murray Bridge, 2, Nairogin, 2, Normantown, 2, Norseman, 2, Northam, 2, Oodnadatta, 3, Ooldea, 2, Perth, 4, Peterborough, 2, Pine Creek, 3, Point Charles Lighthouse, 2, Port Augusta, 2, Port Hedland, 2, Port Lincoln, 2, Port Victor, 3, Red Hill, 7, Richmond, 2, Rockhampton, 3, Roma, 2, Rottnest Island, 2, Sorell, 2, Southern Cross, 2, Southport, 2, Tambo, 2, Tarcoola, 2, Tenterfield, 2, Thursday Island, 4, Townsville, 3, Wagga Wagga, 2, Watheroo Observatory, 11, Werris Creek, 2, Wilcannia, 2, Wongan Hills, 2, Yalata Head, 2	87	226
	New Zealand	Auckland, 3, Christchurch, 7, Clinton, 2, Eketahuna, 2, Kingston, 2, Mount Victoria, 2, New Brighton, 2, Queenstown, 2, Rotorua, 2	9	24
		Totals for Australasia	96	250
Europe	Germany	Postdam, 2	1	2
	Great Britain	Eskdalemuir, 2, Falmouth, 2, Greenwich, 3, Kew, 7, St Anthony, 2	5	16
	Greece	Kephisia, 2	1	2
	Italy	Palermo, 2, Rome, 2, Terracina, 3	3	7
	Russia (U S S R)	Batum, 2, Tiflis, 2	2	4
	Spain	San Roque, 2	1	2
	Turkey	Rumeli Hissar, 6	1	6
		Totals for Europe	14	39

TABLE 3. *Data Regarding Repeat Localities and Occupations for Determination of Magnetic Secular Variation 1905-1926*—Continued

Continent	Country	Repeat localities and occupations	Totals: Localities	Totals: Occupations
North America	Canada	[illegible], 2, Ashe Inlet, 2, Bowdoin Harbor, 1, Cape Dorset, 2, Cumberland House, 2, Dyer's Lake, 2, Englehart, 2, Fort William, 2, Lac Seul, 2, Long Falls, 2, Mattawa, 2, Missinaibi, 2, Metagami, 2, New Liskeard, 2, North Bay, 4, Ottawa, 2, Pelican Narrows, 2, Quebec, 2, St. John, 2, Sydney, 6, Winnipeg, 3	21	46
	Central America	Acajutla, 2, Amapala, 2, Belize, 3, Bluefields, 2, Colon, 13, Corinto, 2, David, 2, El Cayo, 2, Flamenco Island, 2, Flores, 2, Granada, 2, Greytown, 2, Guatemala, 3, Managua, 2, Old Panama, 3, Port Burchard (Panama), 2, Prinzapolca, 2, Puerto Barrios, 2, Puerto Cortes, 2, San José (Costa Rica), 1, San José (Guatemala), 1, San Salvador, 2, Tegucigalpa, 2, Trujillo, 2, Utila Island, 2, Zacapa, 2	26	60
	Greenland	Etah, 2, Godhavn, 2, Godthaab, 2, Holsteinsborg, 2, Refuge Harbor, 1	5	9
	Mexico	Chihuahua, 2, Guaymas, 2, Hermosillo, 2, Monterrey, 2, Nuevas Casas Grandes, 2, Oaxaca, 2, Salinas, 2	7	14
	Newfoundland including Labrador	Battle Harbor, 6, Bay of Islands, 3, Greely, 2, Hopedale, 2, Port Burwell, 3, St. Johns, 4, West Turnavik, 2	7	21
	United States	Baldwin, 4, Bronx Park, 2, Cheltenham, 6, Goat Island, 1, Greenport, 5, Miami, 3, New London, 2, Norfolk, 3, Presidio (San Francisco, Fort Scott), 2, San Diego, 5, San Rafael, 4, Washington, 16, Waycross, 1	11	58
		Totals for North America	78	217
South America	Argentina	Bahia Blanca, 2, Chadileufu, 2, Colonia Las Heras, 2, Corrientes, 2, [illegible], 2, La Quiaca, 3, Las Lajas, 2, Mendoza, 2, Mercedes, 1, Monte Caseros, 2, Pilar, 6, Puerto Deseado, 2, Puerto Madryn, 2, Santa Cruz, 2, Tucumán, 2, Victoria, 2, Zapala, 2	17	40
	Bolivia	[illegible], 3, La Paz, 6, Oruro, 2, Uyuni, 4	4	15
	Brazil	Manaos, 2, Alcobaça, 2, Almeirim, 2, Bahia (Salvador), 2, Barcellos, 2, Bella Vista, 2, Catalão, 2, Corumbá, 4, [illegible], 2, Manaos, 2, Obidos, 4, Pernambuco, 4, Pinheiro, 8, Porto Velho, 4, Registro, 2, Rio de Janeiro, 3, Rio Grande, 2, Santa Isabel, 2, Santarem, 2, Santos, 2, São Paulo de Olivença (Amazon R.), 2, [illegible], 5	[illegible]	80
	Chile	Antofagasta, 1, Arica, 1, Calama, 2, Concepción, 1, Copiapó, 2, Coquimbo, 1, Coronel, 4, Corral, 2, Iquique, 1, Puerto Montt, 1, Punta Arenas, 1, Santiago, 1, Ultima Esperanza, 2, Valparaiso, 1	14	19
	Colombia	Bogotá, 1, Buenaventura, 2, Calamar, 2, Cartagena, 3, Honda, 2, Neiva, 2, Puerto Berrio, 2, Savanilla, 2, Tumaco, 3	9	20
	Ecuador	Esmeraldas, 2, Guayaquil, 4, Quito, 4, Riobamba, 3	4	13
	Guiana	Bartica, 2, Cayenne, 3, Georgetown, 5, New Amsterdam, 3, Onverwacht, 2, Paramaribo, 3, Rockstone, 2, St. Laurent (Maroni), 2, Wismar, 2	9	24
	Paraguay	Concepción, 2, Trinidad, 2	2	4
	Peru	Arequipa, 5, Chimbote, 3, Huacho, 3, Huancayo, 3, Huancayo Observatory (Huayao), 9, Ica, 2, Iquitos, 2, Juliaca, 5, La Merced, 2, Lima, 7, Moquegua, 2, Matucana, 2, Mollendo, 5, Oroya, 2, Paita, 2, Pisco, 2, Piura, 3, Puerto Bermudez, 3, San Lorenzo, 3, Tarma, 2, Yurimaguas, 2	21	65
	Uruguay	Colón, 3	1	3
	Venezuela	Barcelona, 2, Barquisimeto, 2, Caracas, 5, Carupano, 2, Ciudad Bolivar, 2, La Ceiba, 2, La Urbana, 2, Maracaibo, 2, Puerto Cabello, 2	9	21
		Totals for South America	112	304



DESCRIPTIONS OF INSTRUMENTS

MAGNETOMETERS

Since the publication of Volumes I to V, the Department of Terrestrial Magnetism has not made any further material changes in the designs of magnetometers heretofore used. The designations of the types of magnetometers used for the work are as follows:

1. The so-called theodolite-magnetometer type in three designs, viz. (*a*) and (*b*) of the Department of Terrestrial Magnetism, similar, respectively, to magnetometers Nos. 3 and 13, and (*c*) of the United States Coast and Geodetic Survey, similar to C. and G. S. No. 20.
2. The Kew type of magnetometer in two designs, with auxiliary theodolites for astronomical work, viz. (*a*) the regular design as constructed by Elliott Brothers, similar to No. 73, and (*b*) the Magnetic Survey of India design, similar to No. 36.
3. The light and portable type used in the Magnetic Survey of France,[7] similar to No. 11.
4. The universal-magnetometer type in three designs, viz. (*a*) the design of Eschenhagen and constructed with modifications by Tesdorpf,[7] similar to No. 202*b*; (*b*) the magnetometer-dip-circle design of the Department of Terrestrial Magnetism, similar to Nos. 11, 19, 20, 21, and 22; (*c*) the magnetometer inductor design of the same Department, similar to Nos. 23, 24, 25, 26, 27, and 28.

The first three types and design (*a*) of type 4 have been described and illustrated in detail on pages 2 to 7 of Volume I, while designs (*b*) and (*c*) of type 4 have been described and illustrated in detail on pages 5 to 12 of Volume II. Instruments specially adapted for use by the *Maud* Arctic Expedition are described and illustrated in Volume IV (p. 8).

DIP CIRCLES AND EARTH INDUCTORS

The dip circles used in obtaining the data given in the present volume were of the following patterns, of which the first two are fully described and illustrated in Volume I, pages 7 to 10, and the last in Volume II, pages 7 to 12: (*a*) the regular Kew land-pattern as made with slight variations by Dover and by Casella; (*b*) the Lloyd Creak ship-pattern[7] as originally designed by Captain Ettrick W. Creak and made by Dover with some modifications introduced by the United States Coast and Geodetic Survey and by the Department of Terrestrial Magnetism, according to L. A. Bauer's specifications; dip-circle attachment of universal magnetometer of type 4 (*b*).

The types of earth inductor used are fully described and illustrated in Volume I, pages 10 to 11, and in Volume II, pages 13 to 15, and include: (*a*) the design originated by Wild[8] and as modified by Eschenhagen represented in the Department's equipment by No. 48 constructed by Schulze and No. 2 constructed by Toepfer and Son; (*b*) earth inductor of the type made by the Department of Terrestrial Magnetism for the determination of inclination at sea and as represented by earth inductors Nos. 3, 4, and 7; earth-inductor attachment of universal magnetometer of type 4 (*c*).

A list of the various dip circles and earth inductors which were used, together with the needles and their designations, will be found in Table 6.

[7] Not in use during 1921 to 1926.

[8] H. Wild. Inductions-Inclinatorium neuer Construction und Bestimmung der Absoluten Inclination mit demselben in Pawlowsk. St. Petersburg, Mem. Ac. Sc., ser. 7, vol. 38, No. 4, 1891.

REDUCTIONS TO STANDARD INSTRUMENTS

MAGNETIC STANDARDS [illegible]

The Department [illegible] extensive [illegible] Washington in the field and at magnetic observatories [illegible] have made it possible to refer all data to [illegible] Standard. [illegible] Such data obtained during 190[illegible] to 1914 [illegible] Volumes II (pp. 211 to 278) and IV (pp. [illegible]) [illegible] Standards [illegible] stated are [illegible] The [illegible] comparison [illegible] electromagnetic magnetometers [illegible] sufficiently close to [illegible] fulfilling all practical requirements [illegible]

The instruments used [illegible] standard [illegible] the Department [illegible] were the same as those used prior to 1921 for results given in Volumes [illegible] II [illegible] viz. in declination, C. I. W. magnetometer No. [illegible] with [illegible] 0'.1 to observed values; in horizontal intensity, C. I. W. [illegible] zero correction on I. M. S. to observed values; in inclination [illegible] made by Schulze, with zero correction on I. M. S. to observed [illegible]

MAGNETOMETER CORRECTIONS

The corrections of each magnetometer on the adopted [illegible] mined at Washington before and after [illegible] whenever possible, in the field by means of intercomparisons [illegible] The accuracy of the mean correction is usually within about [illegible] and about 0.0001H in horizontal intensity. [illegible] applied algebraically, east declination being reckoned as positive [illegible] tion as negative, horizontal intensity [illegible] always [illegible]

It will be noted that for some of the instruments the H [illegible] time; this is because of gradual change with time during [illegible] inertia, K, of the long magnet system. That such change [illegible] in the tropics and for magnets sheathed with brass, and that [illegible] closely linear with time, is clearly shown by discussion of the results [illegible] intercomparisons at Washington. In some cases the final values [illegible] coefficients P and Q, or P', which result from computations [illegible] 1920, differ from the values used for the original [illegible] several of the instruments the same remark applies for the [illegible] π^2K. The tabulated H corrections are shown by Table [illegible]

INCLINOMETER CORRECTIONS

As in the past for determinations of inclination with the dip circle the polarity of the needle is invariably reversed, eliminating any so-called balance error due to eccentric position of the center of gravity of the needle. There remains, however, the error due to irregularity of figure of pivot, and this will vary in general with

the angle of inclination. Hence the determinations of needle-corrections at a base station, however carefully executed, may not necessarily apply to a region of different inclination. Unfortunately, even when reliable comparison-data were available, the development of tiny rust-spots on the pivots in the course of field work, especially in tropical regions, has made it necessary in almost every case to depend for the corrections upon a critical study of observed needle-differences. The prime purpose of such a discussion has been to adjust the values obtained from each of the needles to the mean of all, and to determine upon the allowable ranges in the inclination results for guidance in rejection of any values. The large accumulation by the Department of well-distributed inclination data during 1914 to 1920 furnished material for some interesting discussions of the effects of minute pivot-defects (see pp. 359 to 371 of Vol. IV).

TABLE 5. *Magnetometer Corrections on Adopted I. M. S. for the Period 1921 to 1926*

No. of magnetometer	Correction to observed: Declination	Correction to observed: Horizontal intensity	Remarks
1	[illegible]	[illegible]	Standard instrument
[illegible]	[illegible]	[illegible]	
6	[illegible]	[illegible]	Overhauled in field a
[illegible]	[illegible]	[illegible]	Standard instrument at Watheroo Observatory
[illegible]	[illegible]	[illegible]	For the year 1921.
[illegible]	[illegible]	[illegible]	From January 1922
10	[illegible]	[illegible]	Standard instrument at Huancayo Observatory
[illegible]	[illegible]	[illegible]	After remaking in March 1922
[illegible]	[illegible]	[illegible]	
14	[illegible]	[illegible]	
16	[illegible]	[illegible]	After remaking in December 1916
[illegible]	[illegible]	[illegible]	
19	[illegible]	[illegible]	After overhauling in April 1924
[illegible]	[illegible]	[illegible]	From May 1921.
[illegible]	[illegible]	[illegible]	From August 1919 to March 1922
[illegible]	[illegible]	[illegible]	From April 1922 to October 1924
[illegible]	[illegible]	[illegible]	From 1925 with new inertia determination
[illegible]	[illegible]	[illegible]	From February 1923 to April 1924
[illegible]	[illegible]	[illegible]	After remaking April to June 1924 after field accident
[illegible]	[illegible]	[illegible]	After remaking August 1924
[illegible]	[illegible]	[illegible]	From January to November 1924, new inertia
[illegible]	[illegible]	[illegible]	After remaking May 1924, following serious field accident of November 1924.
[illegible]	[illegible]	[illegible]	From April 1921, new inertia
[illegible]	[illegible]	[illegible]	For work from May to December 1920.
Brunner c	[illegible]	[illegible]	For 1920 to 1921.

a Corrections subsequently determined from simultaneous field comparisons with other C. I. W. instruments at Mount [illegible] and Port Augusta.

b [illegible] correction applied for short magnet when used in determining declination.

c [illegible] type [illegible] magnetometer belonging to the U. S. Navy Department, corrections as determined at Cheltenham Magnetic Observatory.

d Brunner magnetometer belonging to the Tananarive Observatory of Madagascar, corrections determined by comparisons with C. I. W. magnetometer [illegible] at the Observatory (see *Ter. Mag.*, v. [illegible], pp. [illegible]).

On the other hand, the successful and extended use of the Department's design of field earth-inductor in difficult expeditions has shown it to be an instrument of relatively high precision in absolute determinations. It is noteworthy that the numerous intercomparisons, covering extreme ranges in inclination and involving various types of inductor, show the corrections on standard for inductors to be practically constant for every value of inclination, and certainly well within the

limit of accuracy of observation possible with vertical circles of the sizes used Accordingly, the practice of the Department is now to abandon the use of the dip circle in favor of the earth inductor, except in regions of very high inclination for which the earth inductor is not so well suited primarily because of mechanical troubles caused by the intense cold. An inspection of the corrections on standard for various earth inductors and comparison with those for various dip circles, as given in Table 6, again point forcibly to the desirability of replacing the dip circle by the inductor wherever possible, both in the field and at observatories

The inclination corrections adopted for the various instruments, used in the observations contained in this volume, are given in Table 6; these corrections are to be applied algebraically, regarding inclination, north end of needle down as positive, and south end of needle down as negative.

Table 6 also gives the corrections for the compass-attachments of the dip circles, these corrections are to be applied algebraically to observed results, regarding east declination as positive and west declination as negative.

TABLE 6—*Inclination Corrections on Adopted International Magnetic Standard for the Period 1921 to 1926*

Instrument	Type[a]	Inclination	Corrections for needle				Tabular designation	Correction for compass	Remarks
Dover circle 125	(*a*)	+55° to +56°	No. 4 0′0	No 5 0′0		. .	125 45	. .	Property of United States Navy. Used in the survey operations of the U.S.S. *Nokomis* in December 1926. In view of the erratic behavior of the needles, the means of observed results are taken without correction.
Dover circle 154	(*a*)	+71° to +86°	No 1 +0′6	No 2 +0′4			154 12	. . . . .	For period 1918 to 1921 while used in Asia and the Arctic Sea by the *Maud* Expedition. Corrections determined by comparison with dip circle 205 in the field and with earth inductor 48 at Standardising Magnetic Observatory, Washington.
Dover circle 177	(*a*)	+49°	No 14X +2′3	No. 15X −3′6	No 7 of 242 −1′0	No. 8 of 242 +6′4	177 2X(78)	. . . .	Corrections computed from analysis of comparison observations at Kakioka, Japan, August 1922
Dover circle 177	(*a*)	+58° +56 +54 +52 +50 +48 +46 +44	No 14X −2′2 −2 8 −4 2 −4 2 −3 4 −2 8 −2 0	No 15X −0′6 −1 0 −1 6 −2 5 −3 2	No 7 of 242 −5′0 −5 5 −6 4 −6 4 −6 3 −5 9 −5.2	No 8 of 242 +8′0 +7 5 +6 5 +6 6 +7 0 +7 6 +8 0	177 2X(78)	.	Corrections determined by analysis of observations in north China during 1922 and used in results obtained at Kalgan, Peking, Chengchow, Nanking, and Hankow, July 17 to August 4, 1922.
Dover circle 177	(*a*)	+32°	No 14X 0′0	No. 15X 0′0	No 7 of 242 0′0	No 8 of 242 0′0	177.2X(78)	. . .	Inclination adopted without correction for series of observations at Canton, China, December 1921 to July 1922. Results show wide variability for individual needles, and the value of the in-

[a] For explanation of types, see p. 19.

TABLE 6.—*Inclination Corrections on Adopted International Magnetic Standard for the Period 1921 to 1926*—Continued

Instrument	Type[1]	Inclination	Correction for needle				Tabular designation	Correction for compass	Remarks
Dover circle 17? (cont.)									clination gradually decreased, as shown by all four needles. No cause can be assigned for this decrease, and the mean value for the whole period of six months should be used in any discussion of secular variation. Needle 15N developed a large correction on May 2, 1922, which persisted until the observations at Chengchow, July 26, 1922
			No. 11N	No. 1?N	No. 7 of 242	No. 8 of 242			
Dover circle 1??	[illegible]	[illegible]	0.0	0.0	0.0	0'.0	17? 2N?8?		Inclination adopted without correction for Colombo, Aden, Jibuti, and Mombasa, owing to erratic behavior of individual needles during August 31 to October 10, 1921
			No. 11N	No. 15N	No. 7 of 242	No. 8 of 242			
Dover circle 17?	?a	1?	0.0	[illegible]	0.0	0'.0	177 2N?7?		Inclination adopted without correction for Singapore, November 1921
			No. 11N	No. 15N	No. 7 of 242	No. 8 of 242			
Dover circle 1??	?a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	177 2N?76		Corrections determined by analysis and scaled from smoothed graph. Used for observations in Tanganyika Territory and Kenya Colony, East Africa, July 14 to August 23, 1921
			No. 11N	No. 15N	No. 7 of 242	No. 8 of 242			
Dover circle 177	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	177 2N?78		Corrections determined by analysis of observations in Madagascar, January to June 1921
			No. 11N	No. 15N	No. 7 of 242	No. 8 of 242			
Dover circle 177	a?	61	0.1	[illegible]	[illegible]	0.1	177 2N?78		Corrections determined by comparison with earth inductor 2 at Watheroo Magnetic Observatory, October 24-26, 1921, and used for observations in Australia
			No. 1	No. 2					
Dover circle 181	a	?42 to ?44	0.0	0.0			181 12		Property of United States Navy. Used in the survey operations of the U.S.S. *Niagara* in 1926. In view of the erratic behavior of the needles, the means of observed results are taken without correction.

[1] For explanation of types, see p. 19

TABLE 6—*Inclination Corrections on Adopted International Magnetic Standard for the Period 1921 to 1926*—Continued

Instrument	Type[a]	Inclination	Corrections for needle				Tabular designation	Correction for compass	Remarks
Dover circle 201	(*a*)	−62° to −67°	No 1X +1'0	No 2X −0'4	No 4X 0'0	No 6X +0'2	201 1246	.	Corrections determined by comparisons with earth inductor [illegible] at Watheroo Magnetic Observatory, January 4 11, 192[illegible] [illegible] in Australia during 1921
Dover circle 205	(*a*)	+71° to +86°	No 1 −0'2	No 2 −0'2	No 5 −0'1	No. 6 −0'2	205 1256	+21'2	Used on the *Maud* Expedition during 1918 to 1921. Logarithms of total intensity constants for needle pairs [illegible] and [illegible], 7 and [illegible], and 8 of 178 are [illegible], 9 [illegible]61, and 9 [illegible] (March 1922)
			No 3 +1'2	No 7 −0'8	No 7 of 178 −0'7		205 37(7)		
Dover circle 205	(*a*)	+71° to +86°	No 1 0'0	No 2 0'0	No 3 of 223 0'0	No 6 0'0	205.126(3)	9'	Used on the *Maud* Expedition during 1922 to 192[illegible]. Logarithms of total intensity constants for needle pairs 3 and 4, and [illegible] and [illegible], are 9 57[illegible] + 0 000[illegible] (t − 1922 0) and 9 57[illegible] + 0 [illegible] (t − 1922 0)
			No 3 0'0	No 7 −1'5	.	. .	205 37		For period August 1922 to February 1923.
			−1 0	−1 5		. .			For period March 1923 to July 1924.
			−2 0	−1 5					For period October 1924 to May, 1925.
Dover circle 223	(*a*)	+ 4° to − 2°	No 1	No 2	No 5	No 6	223 1256	+2'0	Used in Liberia beginning December 192[illegible]. Corrections determined by comparisons with earth inductor [illegible] at [illegible]ing Magnetic Observatory, Washington
			Mean for four needles, 0'0						
Dover circle 226	(*a*)	−62° to −67°	No. 1 −0'2	No. 2 −2'1	No. 1A 0'1	No. 2A −1'1	226 12(12)		Corrections determined by comparisons with earth inductor [illegible] at Mount Lofty and Port Augusta, February and May, 192[illegible], and used for observations in Australia in 192[illegible].
Dover circle 241	(*a*)	+71° to +87°	No 1 −0'2	No. 2 +1'2	No 5 +0'8	No. 6 +0'8	241 1256	1'0	Used on the MacMillan Baffin Island Expedition of July 192[illegible] to October 192[illegible]. The correction for inclinations from needle 7 deflected by needle 8, [illegible]. Logarithm of total intensity constant for needle pair 7 and 8, 9 61502.
Dover circle 241	(*a*)	+71° to +87°	No 1 0'0	No 2 +0'4	No 5 +0'9	No. 6 −0'5	241 1256	8'	Used on the MacMillan North Greenland Expedition of June 1923 to October 1924. The corrections for inclinations from needle 7 deflected by needle 8 were [illegible], 0'9. Logarithm of total intensity constant for needle pair 7 and 8, 9 615[illegible]

[a] For explanation of types, see p 19.

TABLE 6.—*Inclination Corrections on Adopted International Magnetic Standard for the Period 1911 to 1920*—Continued

Instrument	Type[a]	Inclination	Correction for needle				Tabular designation	Correction for compass	Remarks
Dip circle 240	6a	71 to 87	No. 1 +1.1	No. 2 +10'.0	No. 3 1'.4	No. 6 0.2	240 12:6	11'	Used on the MacMillan Baffin Island Expedition of July 1921 to October 1922. The corrections for inclinations from needle 3 of 202 deflected by needle 4 of 202, and from needle 1 of 172 deflected by needle 8 of 202 were +10'.9 and 2'.6. The logarithms of total intensity constants for needle pairs 3 of 202 with 4 of 202 and 1 of 172 with 8 of 202 were 9.08401 and 9.07078.
Dip circle 212	11	71 to 87	No. 1 11'.0	No. 2 of 240 0.8	No. 5 1'.[illegible]	No. 6 10'.1	212 180(2)	2'	Used on the MacMillan North Greenland Expedition of June 1923 to October 1924. The corrections for inclinations from needle 3 deflected by needle 4 of 203 and from needle 1 of 172 deflected by 8 of 203 were 171°2, 15'.0 and 172°, 185°8, +0.5 for the first pair, the second not being used. The logarithm of total intensity constant for needle pair 3 of 203 and 4 of 203, 9.57451.
Brunner		40 to 55	+1'.5				Brunner		Medium size model of the French type of dip circle. This circle is the property of the Tananarive Observatory at Madagascar and was used in Madagascar at two stations reported upon in this volume. The correction indicated is for the mean of the two needles and was determined at Tananarive in November 1920 (see Vol. IV, pp. 400 to 401).
Earth inductor 2	b	All values	0.0				EI 2		Used since 1918 at the Watheroo Magnetic Observatory, Australia.
Earth inductor 5	c	All values	0'.0				EI 5		Used as standard in conjunction with magnetometer inductor 25 at Carnegie shore stations.
Earth inductor 4	c	All values	0'.3				EI 4		For period May 1922 to March 1923 after repairs.
Earth inductor [illegible]	b	All values	0.0				EI [illegible]		Used since February 1919 at the Huancayo Magnetic Observatory, Peru.
Earth inductor 6A	c	All values	0.5				EI 6		Used in Bermuda.
Earth inductor 7		All values	0.2				EI 7		Used as standard in conjunction with magnetometer inductor 25 at Carnegie shore stations.
Earth inductor 7	c	All values	0.4				EI 7		For period March 1922 to September 1923.
Earth inductor 48[e]	d	All values	0.0				EI 48		Standard instrument of the Department since 1907.
Magnetometer inductor 24	3	All values	0.4				EI 24		
Magnetometer inductor 25	4	All values	0.0				EI 25		Standard inclination instrument at *Carnegie* shore stations.

[a] For explanation of types, see p. 19.
[b] Wild-Eschenhagen type, as made by Toepfer and Son, with Department modifications.
[c] Marine type, made by the Department of Terrestrial Magnetism.
[d] Wild-Eschenhagen type, as made by Schulze.
[e] Designated by maker's number; this instrument is serial No. 1 of the Department.

TABLE 6—*Inclination Corrections on Adopted International Magnetic Standard for the Period 1921 to 1926*—Concluded

Instrument	Type[a]	Inclination	Corrections for needle				Tabular designation	Correction for compass	Remarks
Magnetometer-inductor 25	4(c)	All values	0 0				EI 25		For period April 1922 to October 1923 and for 1925
Magnetometer-inductor 26	4(c)	All values	−0 2				EI 26		For period 1925 and 1926
Magnetometer-inductor 27	4(c)	All values	0 0				EI 27		For period July 1921 to accident at San José, November 1923
Magnetometer-inductor 27	4(c)	All values	−0 3				EI 27		From May 1924 to August 1926
Magnetometer-inductor 28	4(c)	All values	0 0				EI 28		

[a] For explanation of types see p 19

METHODS OF OBSERVATION

The general methods followed, both for the observational and computational work, as well as the instrumental equipments, have continued the same as described in Volumes I, II, and IV The results have been tabulated in accordance with the conventions already adopted. The interested reader may be referred to Volumes I, II, and IV, for any desired additional information, also for specimens of observations and of computations and descriptions of instruments

With the change of emphasis from securing distribution data for use in constructing charts and in theoretical discussions, which called for rapid movement of the observer in order that the field might be quickly covered, to that of securing data for secular-variation studies, which permits a wider separation of stations, it has been possible to expand somewhat the program of observations In arranging schedules of stations to be reoccupied, they are placed in three classes according to the extent of the program desired at each A series of stations called "class I" stations is first chosen, consisting of localities easily reached, and spaced at intervals of 500 to 800 miles, according to circumstances At these stations, besides the usual program of observations, the observer spends one day making observations for diurnal variation in declination and horizontal intensity and one day in inclination The observations extend from the early morning to late evening without interruption, covering the daylight period of the day, usually from 10 to 13 hours

At a second group of stations designated "class II" stations at points intermediate between the class I stations and usually about 200 miles apart, the observer repeats the program of observations on a second day, trying as far as practicable to make the observations for each element fall near the time of its maximum value on one day and near its minimum on the other Besides giving some notion of the possible range of the diurnal change, this method diminishes the chance that the values of any element may be found at a time of disturbance At both class I and class II localities the observer selects a second station, in order to test for possible existence of local disturbance, and at the same time to protect the secular-variation series from being broken by building or other disturbing operations in the vicinity

Only the usual program of observations is carried out at class III stations, which are usually repeat stations easily visited by travel incidental to reaching class I and class II stations

The observations for diurnal variation of declination and horizontal intensity with the field magnetometer consist of deflection observations at one distance only, repeated at intervals of 20 minutes From such observations with instruments of the type designed and used by the Department, when properly controlled for temperature, and with care to protect against movement of the instrument during the progress of the work, both declination and horizontal intensity can be computed. The observations for diurnal variation of inclination consist simply in making repeated determinations with the earth inductor at intervals of 20 minutes. Since the type of the earth inductor used in the field can be relied upon to give values within $0'2$ to $0'5$, a sufficiently accurate curve can be derived from those observations to serve the desired purpose of correcting field observations to the mean of day when made at long distances from magnetic observatories

LAND MAGNETIC OBSERVATIONS, 1921–1926

EXPLANATORY REMARKS

Precisely the same conventions have been followed in the presentation of the field results obtained during the six years 1921 to 1926 as adopted in Volumes I, II, and IV. These conventions, briefly recapitulated, are as given in the following paragraphs

It has not been deemed advisable to attempt at present to apply corrections to the observed results on account of the numerous variations of the Earth's magnetism, *e g.*, diurnal variation, secular variation, magnetic perturbations, etc Instead, it is believed to be better to publish the observed results as obtained, with no corrections applied except the reductions to the magnetic standards of the Department, as fully explained in the section on this subject It will be noticed, however, that opposite the magnetic elements appearing in the Table of Results, the precise date and local mean time of each observation are given The reader is thus supplied with the required information in case he may find it necessary to reduce the observed values to some mean time.

The arrangement of stations is according to the same main geographic divisions adopted for the previous volumes, with the addition of a group of stations in the Mediterranean Sea which it seemed expedient to place together, and a division called Arctic Sea, which was necessary to provide a place for stations of the *Maud* Expedition These are properly classed with land results, although made over the Arctic basin. The instruments used and the methods of observation were the same as those at land stations in the Arctic, a condition made possible by the relatively slow movement of the drift-ice upon which the work was done. These main divisions then are Africa, Asia, Australasia, Europe, North America, South America, Islands, Atlantic Ocean, Islands, Indian Ocean; Islands, Mediterranean, Islands, Pacific Ocean, and Arctic Sea.

These main divisions have not been rigidly followed, and many exceptions will be noted The purpose has been to place each station where it would be most readily found or with stations to which it bears a natural relation Thus Great Britain is classed with Europe, Japan with Asia, Greenland and adjacent islands with North America, instead of being placed in the classification of islands of Atlantic or Pacific. Under each main division there are broad subdivisions, sometimes comprising a single country, but sometimes grouping several political or physical divisions for the sake of convenience. In general these subdivisions remain the same in this volume as in those preceding, but changes which have taken place make necessary some readjustments This is particularly true in Asia Minor and in Africa. It is believed that where such changes have been made the reasons are self-explanatory and will not interfere with the use of these tables in connection with the earlier ones.

The tabular entries under these subdivisions are in the order of decreasing north or increasing south latitude; that is to say, in the order of increasing colatitude

counting from the North Pole to the South When there are stations of the same latitude, their order is according to increasing east longitude, counting continuously from the standard meridian of Greenwich, or from zero to 360 degrees

The question whether to give values of the horizontal intensity, exclusively, or values of total intensity, was decided, for practical reasons, in favor of the former Usually the horizontal intensity rather than the total is observed, and most likely will continue to be for some years at least Only in high magnetic latitudes, where the horizontal intensity is small and hence its observation more or less difficult, are total intensities generally obtained Rather than give total intensities, as derived by computation with the aid of the observed horizontal intensity and inclination, it is thought a better procedure to compute, in the considerably smaller number of cases, the horizontal intensity from the observed total-intensity and inclination, the resulting values being italicized in order to reveal their derivation

It was also decided to publish the intensities in C G S units[3] In magnetic-survey work on land the fourth decimal is often uncertain by one or more units and in ocean work the error may be five or more units in this decimal place For these reasons it appears inadvisable for field results to adopt so small a unit as a small gamma, $\gamma=10^{-5}$ C G S. unit, it would be necessary otherwise at times to round out the observed value by one or more zeros If the conditions under which an intensity result was obtained were such as not to warrant publishing the fourth or fifth decimal, this is shown by stopping with the decimal which indicates the order of reliability In general, however, as will be seen, the value to the fifth decimal is given, but it should be understood that no claim is made as to the correctness of the last figure, it has been retained here primarily in order that when all reductions to common epoch have been applied on account of the magnetic variations, an error of a unit in the fourth decimal, due purely to computation, will not enter

The first column in the table is headed "Station", this gives the name of place at which the magnetic elements were observed, the spelling adopted being in accordance with the most reliable information at hand and conforming where practicable to local usage

There are some names for which a system of phonetics other than English is locally used, but which have become well known in their anglicized form In these cases the form adopted by American or English authorities has preference to the local spelling, for example, Timbuktu instead of Tombouctou and Jibuti instead of Djibouti Accents and diacritical marks in general are omitted. The acute accent following the final *e* in French and Spanish names is usually retained, as is the tilde over the *a* in the diphthong *ao* in certain Portuguese names

The next column gives the geographical position, latitudes, and longitudes, as derived in most cases from the observers' local astronomical observations following the methods already described in Volumes 1 to IV When the latitudes are the results of fairly complete circummeridian observations of the Sun, or the means of

[3] The capital gamma, Γ, was used in Volumes I and II to designate a C G S unit of magnetic intensity, but as it is not generally used for this purpose, its use was discontinued beginning with Volume III

several reoccupations of the same station, or are derived from reliable large-scale maps, then they are given to the nearest 0′1, though it should be distinctly understood that this accuracy is not guaranteed, as even for these cases the error may be as much as 0′5, and even in some instances a whole minute of arc. When the latitudes are given only to the nearest minute, there were either no astronomical determinations, or they may have been incomplete or defective, these values are usually taken from standard atlases and for some regions may be in error by several minutes Owing to the numerous sources of error of a longitude determination, and especially because of the uncertainty in more or less unexplored countries of the adopted chronometer-correction on standard time, the longitude in no instance is tabulated closer than to the nearest minute of arc Usually it is derived from the observers' astronomical observations Considerable use was also made of reliable large-scale maps, whenever available, and of standard atlases, the values in regions but slightly surveyed may be out sometimes by several minutes. By far the larger part of the stations which appear in this volume consists of reoccupations of stations whose positions have already been published The value previously adopted is usually retained, except when there is good evidence that a revised value is more accurate

The date on which the magnetic observations were made will be found in the fourth column The following abbreviations have been adopted for the months of the year: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec The values of the magnetic elements will be found in the next columns as observed at the local mean time, expressed to nearest 0 1 hour, opposite each value Occasionally it has appeared desirable, where diurnal variation in any element was observed or where numerous observations were made during a limited interval, to give the local mean times of the beginning and of the end of the series and to indicate the number of determinations from which the mean value is derived by a number inclosed in parentheses, thus, 9ʰ 1 to 11ʰ 3 (7) is to be read "the mean is the result of seven determinations made during the interval 9ʰ 1 to 11ʰ 3, local mean time, inclusive", 6ʰ 1 to 20ʰ 3 (dv) is to be read "repeated observations were made regularly at short intervals from 6ʰ 1 to 20ʰ 3, local mean time" For observatories and other fixed stations, where observations were made frequently, it has appeared desirable to give only the mean values of the magnetic elements as determined at approximately the same local mean times on each of the days grouped in the date column (see entries for Watheroo Observatory, Huancayo Observatory, and Washington Standardizing Magnetic Observatory).

The local mean times are given according to civil reckoning and are counted from midnight as zero hour continuously through 24 hours; 16ʰ, for example, means 4 o'clock p. m

The declination and inclination values are in general given in degrees, minutes, and tenths of minute of arc For instruments which are not regarded as capable of yielding great accuracy only the nearest minute is given The tabulation of values of the horizontal intensity has previously been explained.

The instruments used are shown in the columns "Mag'r" (magnetometer) and "Dip Circle." When the number of an instrument in magnetometer column is italicized, it means that a dip circle has been used in getting the declination by means of the compass attachment, and that total instead of horizontal intensity was observed The instrument used for determination of inclination is indicated in the column headed "Dip Circle" With the exception of work done in cooperation with other organizations which have provided their own instruments, and of the work in the Arctic for which the electric method has not as yet been fully adapted, the dip circle has been superseded by the earth inductor as the inclination instrument. This is indicated by the letters *EI* followed by the number of the instrument used Where no letters are prefixed it is understood that the instrument was the dip circle indicated by the first group of figures, the following group representing the needles used for the particular observations standing in the same line, for example, 205 123 shows that needles No 1, No 2, and No. 3 were used in dip circle No 205, the mean value only being given, 226 12 (12) shows that needles Nos 1 and 2 were used in dip circle No 226, together with needles Nos. 1 and 2 from some other circle as indicated by the parenthesis Each designation in the Table of Results will be found with its corresponding interpretation in Table 6 entitled "Inclination Corrections"

CONCERNING GEOGRAPHIC POSITIONS

Full use in theoretical discussions of accurate magnetic observations requires that the geographic coordinates of stations be known with a fair degree of accuracy (see Volume I, pp 22 *et seq*) The determination of latitude is comparatively simple, and in general, as already stated for the methods followed (see p. 30), the error in this coordinate is usually less than 0′5, and usually within about 0′.2. The determination of longitude, on the other hand, is subject to a greater uncertainty.

Unlike the work of the earlier years of the magnetic surveys of the Department, a relatively small proportion of the stations in this report is in places for which no longitude has been previously determined. The requirements of the work have not justified the added burden of carrying radio equipment for longitude and time determinations On one expedition only has that been attempted, and then for the special cooperative work with the expedition of the Department of Mid-American Archæology to Guatemala in 1923 (see report by W. A. Love on pp. 183–188) The usual method has been that of transporting time by means of three or more high-grade watches, controlled as often as possible either by direct signals by radio, telegraph, or cable, or by astronomical observations at stations whose positions have been previously determined

At all stations, unless prevented by lack of time or by cloudy weather, observations on the Sun, or on a star, are made to obtain the correction of the timepiece on local mean time Night work, such as required by observations of occultations, or of eclipses of the moons of Jupiter, is usually objectionable, especially in the tropical regions, where much of the Department's work has been done, on account of risk to the observer's health and to the success of the expedition. Since, further-

more, such observations are long and troublesome to reduce, and can only be made at predicted times, without opportunity for desired repetitions and checks, no very serious attempts have been made to use occultations, or similar astronomical methods, for the determination of longitude Some regions are so well mapped that the required longitudes may be scaled from the maps with sufficient accuracy, thus, for the extensive work in Australia, satisfactory geographic positions could be obtained with the aid of the excellent system of surveys covering most of that country.

As the result of the experiences gained on numerous expeditions, it is found that the best of watches often become unreliable when subjected to the trying conditions of a field expedition extending over several months In such cases, the longitudes of the most important points as obtained from the best available sources are accepted, and the intermediate positions are derived, with the aid of the determined watch-rates, by interpolation

TABLE 7—*Land Magnetic Observers, 1921–1926*

Observer	Designation	Observer	Designation	Observer	Designation
R Amundsen[a]	RA	J E Sanders, Jr	JES	Green and Love	G&L
J P Ault	JPA	J Shearer	JS	Grummann and Johnston	G&J
R T Booth	RTB	H U Sverdrup[a]	HUS	Johnston and Cairns	J&C
F Brown	FB	O W Torreson	OWT	Johnston, Cairns, and Torreson	J,C,T
J Cairns	JC	G R Wait	GRW	Johnston, Cairns, and Wait	J,C,W
D G Coleman	DGC	W F Wallis	WFW	Johnston and Green	J&G
E Colin[b]	EC	O Wisting[a]	OW	Johnston and Torreson	J&T
J Courts[c]	JCo	W H Woods	WHW	Johnston and Wait	J&W
L C Daves[d]	LCD	Amundsen and Sverdrup[a]	A&S	Kennedy and Maddern[e]	K&M
P H Dike	PHD	Ault and Goddard	A&G	Kennedy and Waterford[e]	K&W
G F Dodwell[e]	GFD	Ault and Skilling[i]	A&S	Maud Expedition[a]	MEx
H W Fisk	HWF	Booth and Coleman	B&C	Parkinson and Booth	P&B
R H Goddard	RHG	Booth and Goddard	B&G	Parkinson, Booth, and Coleman	P,B,C
J W Green	JWG	Booth, Goddard, and Kampe	B,G,K	Parkinson, Kidson,[g] and Shearer	P,K,S
H R Grummann	HRG	Brown and Shearer	B&S	Parkinson and Little	P&L
H Hanssen[a]	HH	Cairns and Torreson	C&T	Parkinson and Shearer	P&S
J T Howard	JTH	*Carnegie* Cruise VI[j]	CVI	Parkinson and Wait	P&W
G D Howell[f]	GDH	Daves and Bussell[d]	D&B	Shearer and Cairns	S&C
H F Johnston	HFJ	Daves and Cheeks[d]	D&C	Sverdrup and Hanssen[a]	S&H
A H Kampe	AHK	Dodwell and Maddern[e]	D&M	Sverdrup and Malmgren[a]	S&M
A L Kennedy[e]	ALK	Edmonds and Coleman	E&C	Sverdrup and Wisting[a]	S&W
E Kidson[g]	EK	Fisk and Howard	F&H	Wait and Cairns	W&C
P Knudsen[a]	PK	Fisk and Grummann	F&G	Wait and Shearer	W&S
S E Latimer[h]	SEL	Fisk and Wallis	F&W	Wait, Shearer, and Cairns	W,S,C
J Lindsay	JL	Fleming and Nicholson[k]	F&N	Wait, Torreson, and Cairns	W,T,C
C M Little	CML	Goddard and Howell[f]	G&H	Wallis and Little	W&L
W A Love	WAL	Goddard and Kampe	G&K	Wallis and Wood	W&W
F Malmgren[a]	FM	Goddard and Parkinson	G&P	Wisting and Hanssen[a]	W&H
W C Parkinson	WCP	Goddard, Parkinson, and Kampe	G,P,K	Wisting and Malmgren[a]	W&M

[a] The observers of the *Maud* Expedition (Amundsen Arctic Expedition) of 1918-1920, were R Amundsen, H U Sverdrup, O Wisting, H Hanssen, and P Knudsen, those on the expedition of 1921-25, were H U Sverdrup, O Wisting, F Malmgren, O Dahl, G Olonkin, K Hansen, and S Syvertsen

[b] Reverend Elie Colin, S J, Director of the Observatory of Tananarive, Madagascar

[c] Lieutenant (j g) Jennings Courts, U S N, of the U S survey vessel *Niagara*

[d] L C Daves, C T Bussell, and C G Cheeks, of the Liberian Boundary Survey

[e] G F Dodwell, Astronomer, A L Kennedy, Assistant Astronomer, C A Maddern, and L M Waterford, of the Adelaide Observatory, South Australia

[f] G D Howell, of the MacMillan Baffin Island Expedition

[g] E Kidson, of the Meteorological Office, Melbourne, Victoria, Australia

[h] Ensign S E Latimer, U S N, of the U S, survey vessel *Nokomis*

[i] Professor W T Skilling and Professor N W Cummings of the State Teachers' College of San Diego, California, assisted with eclipse observations of September 9, 10, and 11, 1923

[j] The observers on Cruise VI of the *Carnegie* were J P Ault (commanding), H F Johnston, R Pemberton, A Thomson, H R Grummann, and R R Mills

[k] J A Fleming assisted by Seth B Nicholson of the Mount Wilson Solar Observatory

TABLE 8—*Summary Showing the Geographical Distribution of Magnetic Stations, 1921–1926*

Countries and subdivisions	No of stations: Primary	No of stations: Auxiliary and secondary	C I W repeat localities[a]	Totals by country
Africa				113
Abyssinia	3	1	3	
Algeria	2		2	
Algerian Sahara	1		1	
Cameroun	1	1	1	
Egypt	3	1	3	
French Somaliland	1		1	
French West Africa	24	15	22	
Gold Coast Colony	3	3	3	
Kenya Colony	6	1	6	
Liberia	3	3	3	
Morocco	6	2	6	
Nigeria	8	8	8	
Sierra Leone	3		3	
Tanganyika	11	1	4	
Tunisia	2		2	
Asia				394[b]
Arabia	4	2	2	
China	7		6	
Indo-China	2		2	
Japan	1	2		
Siberia[c]	61	303	6	
Straits Settlements	1	2	1	
Turkish Empire	9		9	
Australasia				117
Australia	94	12	75	
New Zealand	11		8	
Europe				24
Belgium	1	1		
Denmark	1	1		
Finland	1			
France	1			
Germany	1		1	
Great Britain	4	2	3	
Greece	1		1	
Holland	1			
Italy	1	1	1	
Portugal	1	1		
Spain	2	1		
Turkey	2		1	
North America				202
Canada	24	8	3	
Central America	41	18	31	
Greenland	8	2	5	
Mexico	22	16	7	
Newfoundland (Labrador)	10	2	5	
United States[d]	36	15	8	
South America				240
Argentina	16	11	15	
Bolivia	4	2	4	
Brazil	67	26	21	
Chile	12	10	12	
Colombia	11	1	6	
Ecuador	5	4	5	
Guiana	7	4	7	
Paraguay	3	1	2	
Peru	26	16	13	
Uruguay	1	1	1	
Venezuela	0	3	8	
Islands Atlantic Ocean				203
Azores	4	5		
Bahamas	11	3		
Bermuda	5	105	6	
Canary Islands	3	1	2	
Falkland Islands	3	2	1	
Madeiras	1	3	1	
West Indies	41	16	18	
Islands Indian Ocean				71
Ceylon	1	1	1	
Java	1	1	1	
Madagascar	62	4	1	
Zanzibar	1		1	
Islands Mediterranean				4
Crete	1		1	
Cyclades	1			
Cypress	1		1	
Rhodes	1		1	
Islands Pacific Ocean				75
Bismarck Archipelago	1		1	
Borneo	5			
Celebes	1			
Cook Islands	2	2	1	
Ellice Islands	8	1	8	
Fiji Islands	2		1	
Hawaiian Islands	1	1	1	
Lord Howe Island	1		1	
Marquesas	2			
New Caledonia (Loyalty Islands)	5		5	
New Guinea	8	1	7	
New Hebrides	4		1	
Samoa Islands	3	6	3	
Society Islands	3	1	2	
Solomoan Islands	8		7	
Tokelau Islands	3		3	
Tonga Islands	2		2	
Tuamotu Islands	3	1		
Grand total				1,443

[a] The actual number of reoccupied stations is considerably greater than enumerated, since repeat-stations close together are counted as one locality and reoccupations of the same station at different times during 1921 to 1926 are counted but once.

[b] Including 41 stations published in this volume which were occupied by the *Maud* during 1918 to 1920 but not published in Vol IV

[c] Including stations occupied by the *Maud* in the Arctic Sea

[d] Including stations in the Standardizing Magnetic Observatory of the Department of Terrestrial Magnetism at Washington, only the results with standard instruments (magnetometer C I W No 3 and earth inductor C. I W. No 48) in connection with the determinations of constants and the standardization of instruments are given.

AFRICA

FRENCH WEST AFRICA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Bourem	16 56 7 N	359 37	Mar 22, '26	9 3,10 8	11 01 6 W	11 3,11 5	19 32 3 N	9 8,10 4	32158	26	EI 26	JES
Timbuktu, *A*	16 46 3 N	356 58	Mar 4, 26	13 9,15 2	12 11 1 W	17 2,17 5	20 13 3 N	14 2,14 9	31986	26	EI 26	JES
			Mar 6, 26	6 7 to 18 1 (dv)	12 11 3 W			6 7 to 18 1 (dv)	31934	26		JES
			Mar 8, 26			6 3 to 18 1 (dv)	20 12 6 N				EI 26	JES
Timbuktu, *B*	16 46 3 N	356 58	Mar 5, 26	9 5,10 9	12 08 0 W	11 6,11 8	20 07 8 N	9 8,10 6	32038	26	EI 26	JES
Podor, *A*	16 39 6 N	345 03	Nov 16, 25	15 6,17 1	16 50 8 W	14 7,14 8	26 17 4 N	16 1,16 8	30788	26	EI 26	JES
			Nov 17, 25	7 4, 9 5, 9 7	16 48 3 W	10 3,10 5	26 16 4 N	7 8, 8 4	30820	26	EI 26	JES
Podor, *B*	16 39 2 N	345 03	Nov 18, 25	10 1,11 3	16 51 0 W	12 6,12 8	26 11 6 N	10 4,11 0	30864	26	EI 26	JES
St Louis, *B*	16 02 9 N	343 31	Dec 4, 25	9 3,10 6	17 19 2 W	11 2,11 3	26 09 2 N	9 6,10 3	30784	26	EI 26	JES
St Louis, *A*	16 02 8 N	343 31	Dec 3, 25	12 8,14 2	17 24 3 W	15 8,16 0	26 15 1 N	13 2,13 9	30762	26	EI 26	JES
Niafunké	15 55 6 N	356 00	Feb 24, 26	16 4	12 41 0 W	11 4,11 6	18 51 4 N	16 7,16 9	31604	26	EI 26	JES
Ansongo	15 39 7 N	0 30	Mar 27, 26	8 8,10 0	10 45 3 W	10 7,10 8	16 41 4 N	9 1, 9 7	32460	26	EI 26	JES
Matam, *A*	15 39 4 N	346 46	Nov 5, 25	15 8,17 2	16 36 8 W	14 7,14 9	23 20 4 N	16 1,16 8	31114	26	EI 26	JES
			Nov 6, 25	7 2, 8 4	16 35 0 W	9 5, 9 6	23 20 0 N	7 4, 8 1	31132	26	EI 26	JES
Matam, *B*	15 39 2 N	346 46	Nov 4, 25	7 7, 9 3	16 34 8 W	12 2,12 3	23 16 4 N	8 1, 8 9	31194	26	EI 26	JES
Dakar, *A*	14 42 0 N	342 34	Oct 6, 25	14 9,16 8	17 57 6 W	17 4,17 6	23 32 8 N	15 5,16 4	30705	26	EI 26	JES
			Oct 8, 25	6 1 to 17 7 (dv)	17 57 5 W			6 1 to 17 7 (dv)	30731	26		JES
			Oct 11, 25			6 3 to 17 7 (dv)	24 31 8 N				EI 26	JES
			Dec 9, 25	9 0,10 3	17 55 4 W	11 0,11 1	24 24 4 N	9 3,10 0	30693	26	EI 26	JES
Dakar, *B*	14 42 0 N	342 34	Oct 7, 25	12 5,12 7,14 2	18 00 0 W	15 9,16 0	24 34 6 N	13 3,13 7	30712	26	EI 26	JES
			Dec 11, 25	8 6,10 0	17 56 4 W	10 9,11 1	24 25 0 N	9 0, 9 7	30708	26	EI 26	JES
Mopti, *A*	14 29 8 N	355 47	Feb 17, 26	16 4,17 8	13 03 4 W	13 8,14 1	15 47 5 N	16 7,17 5	31950	26	EI 26	JES
			Feb 18, 26	9 7,11 0	13 09 4 W	11 6,11 8	15 47 4 N	10 0,10 7	31980	26	EI 26	JES
Mopti, *B*	14 29 8 N	355 47	Feb 19, 26	10 0,11 2	13 01 0 W	9 6, 9 8	15 47 8 N	10 3,10 9	32020	26	EI 26	JES
Kayes, *A*	14 26 9 N	348 34	Oct 23, 25	13 6,15 1	16 04 4 W	16 0,16 1	19 51 0 N	13 9,14 7	31332	26	EI 26	JES
			Oct 24, 25	9 0,10 4	16 02 7 W	11 0,11 1	19 47 4 N	9 4,10 1	31370	26	EI 26	JES
Kayes, *B*	14 26 8 N	348 34	Oct 21, 25	9 7,11 1	15 56 8 W	12 7	19 38 8 N	10 1,10 8	31498	26	EI 26	JES
			Oct 21, 25			15 1,15 4	19 41 6 N				EI 26	JES
Tambacounda	13 47 4 N	346 22	Oct 18, 25	7 0, 8 4	16 48 3 W	11 0,11 1	19 45 8 N	7 4, 8 1	31185	26	EI 26	JES
Niamey, *B*	13 30 7 N	2 07	Apr 2, 26	17 6	10 32 9 W	13 3,13 5	11 17 6 N	17 9,18 3	32466	26	EI 26	JES
			Apr 3, 26	5 9, 6 9	10 32 8 W			6 1, 6 6	32455	26		JES
Niamey, *A*	13 30 5 N	2 07	Apr 3, 26	16 6,17 8	10 33 7 W	15 9,16 1	11 17 3 N	16 6,17 5	32457	26	EI 26	JES
			Apr 4, 26	8 8,10 0	10 31 2 W	10 3,10 5	11 16 6 N	9 1, 9 7	32506	26	EI 26	JES
Segou, *B*	13 26 9 N	353 43	Feb 12, 26	9 9,11 1	13 56 6 W	11 4,11 7	14 29 5 N	10 2,10 8	31878	26	EI 26	JES
Segou, A	13 26 7 N	353 43	Feb 10, 26	16 3,17 7	13 57 2 W	14 0,14 2	14 30 3 N	16 7,17 4	31841	26	EI 26	JES
			Feb 11, 26	9 4,10 8	13 56 0 W	11 2,11 4	14 29 6 N	9 8,10 5	31832	26	EI 26	JES
Koulikoro, *B*	12 52 7 N	352 28	Jan 14, 26	9 4 10 9	14 41 8 W	11 2,11 4	13 56 6 N	9 8,10 6	31746	26	EI 26	JES
Koulikoro, *A*	12 52 5 N	352 27	Jan 13, 26	8 4,10 8	14 44 4 W	11 4,11 6	13 58 2 N	9 8,10 5	31747	26	EI 26	JES
			Jan 13, 26					16 5	31753	26		JES
			Jan 15, 26			6 5 to 17 7 (dv)	13 58 9 N				EI 26	JES
			Jan 18, 26	6 5 to 18 1(dv)	14 48 2 W			6 5 to 18 1 (dv)	31765	26		JES
Gaya, *A*	11 52 7 N	3 31	Apr 9, 26	9 5,10 8	10 24 6 W	11 1,11 3	7 07 1 N	9 8,10 6	32471	26	EI 26	JES
			Apr 13, 26			6 3 to 17 7 (dv)	7 09 8 N				EI 26	JES
			Apr 14, 26	6 3 to 18 0(dv)	10 27 2 W			6 3 to 18 0 (dv)	32447	26		JES
Gaya, *B*	11 52 7 N	3 31	Apr 10, 26	8 9,10 1	10 24 2 W	10 7,10 9	7 08 4 N	9 2, 9 8	32468	26	EI 26	JES
Kouroussa	10 38 8 N	350 06	Jan 6, 26	9 8,11 1	16 13 8 W	11 5,11 7	10 35 5 N	10 1,10 8	31516	26	EI 26	JES
Mamou, *B**	10 22 9 N	347 55	Dec 30, 25	13 9,16 1	17 10 0 W	16 7,16 9	11 46 8 N	14 2,14 9	31412	26	EI 26	JES
Mamóu, *A**	10 22 4 N	347 55	Dec 31, 25	13 8,15 0	16 55 2 W	16 4,16 6	11 36 6 N	14 1,14 7	31352	26	EI 26	JES
			Jan 1, 26	9 6,11 0	16 54 7 W	11 3,11 5	11 36 6 N	9 9,10 6	31352	26	EI 26	JES
Conakry, *A**	9 30 9 N	346 16	Sep 24, 25	16 7,18 2	17 11 6 W			17 1,17 9	27924	26		JES
			Dec 19, 25	13 8,15 1	17 11 4 W	16 4,16 6	11 06 4 N	14 2,14 8	28007	26	EI 26	JES
Conakry, *B**	9 30 5 N	346 16	Dec 21, 25	9 5,10 9	18 23 2 W	11 4,11 6	11 02 9 N	9 8,10 6	28626	26	EI 26	JES
			Dec 22, 25			6 5 to 17 4 (dv)	11 05 9 N				EI 26	JES
			Dec 23, 25	6 7 to 17 7 (dv)	18 25 4 W			6 7 to 17 7 (dv)	28644	26		JES
Parakou	9 21 2 N	2 40	Apr 18, 26	15 9,17 3	11 14 2 W	15 3,15 4	1 25 2 N	16 4,17 0	32032	26	EI 26	JES
Savé	8 02 1 N	2 31	Apr 21, 26	7 5, 8 8	11 29 0 W	9 3, 9 5	1 31 2 S	7 8, 8 5	31800	26	EI 26	JES
Bouaké, *A*	7 42 N	355 00	Jul 21, 26	15 7,17 0	14 45 0 W	14 1,14 3	1 08 0 N	16 1,16 8	31249	26	EI 26	JES
			Jul 22, 26	8 9,10 1	14 43 7 W	10 4,10 6	1 04 5 N	9 2, 9 8	31272	26	EI 26	JES
Bouaké, *B*	7 42 N	355 00	Jul 22, 26	13 8,15 1	14 43 9 W	16 1,16 3	1 06 8 N	14 2,14 8	31273	26	EI 26	JES
Cotonou, *A*	6 21 5 N	2 25	Apr 27, 26	14 4,15 6	11 57 8 W	16 3,16 5	5 23 2 S	14 7,15 3	31334	26	EI 26	JES
			Apr 28, 26	8 4, 9 7	11 59 0 W	10 1,10 3	5 19 0 S	8 7, 9 4	31360	26	EI 26	JES
Cotonou, *B*	6 21 5 N	2 26	Apr 29, 26	9 4,10 4	12 01 6 W	8 8, 9 0	5 20 7 S	9 6,10 2	31357	26	EI 26	JES
Abidjan	5 19 N	355 58	Jul 26, 26	9 9,11 0	15 04 8 W	9 4, 9 6	4 28 4 S	10 2,10 7	30780	26	EI 26	JES

* Local disturbance

AFRICA

FRENCH WEST AFRICA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Grand Bassam, *A*	5 11 8 N	356 15	Jul 12, '26	16 2,17 3	15 01 0 W	14 3,14 5	5 06 4 S	16 4,17 0	30733	26	EI 26	JES
			Jul 13, 26	9 4,10 7	14 58 8 W	9 0 9 2	5 03 8 S	9 7,10 3	30790	26	EI 26	JES
Grand Bassam, *B*	5 11 5 N	356 15	Aug 4, 26	9 4,10 7	14 54 8 W	11 1 11 3	5 03 2 S	9 7,10 3	30800	26	EI 26	JES

GOLD COAST COLONY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kumasi, *A*	6 41 0 N	358 26	Jun 18, '26	15 9,17 0	13 39 0 W	14 7,14 9	2 57 0 S	16 2,16 7	31192	26	EI 26	JES
			Jun 20, 26	6 7 to 17 4(dv)	13 39 8 W			6 7 to 17 4 (dv)	31214	26	EI 26	JES
			Jun 22, 26			6 6 to 15 8 (dv)	2 57 4 S				EI 26	JES
Kumasi, *B*	6 41 0 N	358 25	Jun 17, 26	15 9,17 1	13 38 5 W	14 4,14 6	2 55 4 S	16 2,16 8	31202	26	EI 26	JES
Accra, *C*	5 34 6 N	359 49	Jun 10, 26	10 7,12 0,12 2	13 15 6 W	15 5,15 7	6 06 1 S	11 0,11 7	30872	26	EI 26	JES
			Jun 11, 26	8 0, 9 2	13 13 8 W					26		JES
			Jun 11, 26	14 3,15 2	13 17 2 W					26		JES
Accra, *A*	5 32 5 N	359 49	Jun 5, 26	15 2,16 5	13 17 0 W	11 1,11 3	5 58 6 S	15 6,16 2	30842	26	EI 26	JES
			Jun 6, 26	9 5,10 8	13 15 4 W	14 0,14 2	6 01 6 S	9 8,10 4	30862	26	EI 26	JES
Accra, *B*	5 32 5 N	359 49	Jun 4, 26	9 8,11 2	13 14 8 W	14 3,14 5	6 00 5 S	10 2,10 8	30896	26	EI 26	JES
Sekondi, *1926*	4 56 4 N	358 18	Jun 26, 26	9 8,11 2	14 10 0 W	14 5	7 10 8 S	10 2,10 9	30740	26	EI 26	JES
			Jun 26, 26	14 9	14 09 5 W			16 0	30684	26		JES

KENYA COLONY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kisumu	0 05 8 S	34 45	Aug 15, '21	7 3, 8 6	3 55 8 W	10 5	23 24 4 S	7 7, 8 3	31424	13	177 2X(78)	FB
Nakuru*	0 17 1 S	36 04	Aug 16, 21	10 0,11 3	4 05 0 W	14 5	24 09 4 S	10 4,11 0	31167	13	177 2X(78)	FB
Nairobi, *B*	1 17 3 S	36 49	Aug 12, 21	10 3,11 7	3 51 8 W	15 2	26 00 4 S	10 7,11 4	30908	13	177 2X(78)	FB
Nairobi, *A*	1 17 5 S	36 50	Aug 11, 21	16 7,18 0	3 38 0 W	15 8	25 39 1 S	17 1,17 7	30900	13	177 2X(78)	FB
Makindu	2 16 8 S	37 49	Aug 19, 21	10 2,11 5	3 41 2 W	15 7	28 08 7 S	10 5,11 2	30602	13	177 2X(78)	FB
Voi	3 23 8 S	38 34	Aug 20, 21	10 1,11 4	3 54 4 W	15 4	30 12 2 S	10 5,11 2	30098	13	177 2X(78)	FB
Mombasa	4 03 3 S	39 41	Aug 23, 21	7 7, 8 9	3 42 0 W	11 5	31 08 9 S	8 0, 8 6	29778	13	177 2X(78)	FB

LIBERIA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Naama	7 16 N	350 37	Aug 14, '24	7 8,10 4,17 3	16 46 3 W			8 7, 9 9	30780	16		D&C
			Aug 14, 24	17 4,17 5,17 7	16 45 5 W					16		D&C
			Aug 15, 24	7 3,18 2	16 44 6 W							
			Aug 15, 24	7 6 to 17 9(dv)	16 47 2 W			7 6 to 17 9 (dv)	30758	16		D&C
			Aug 16, 24	10 0 12 0,18 4	16 48 8 W					16		D&C
			Aug 16, 24			15 1	4 29 9 N	9 2,11 6	30790	16	223 1256	D&C
			Aug 17, 24	19 1 to 17 7 (dv)	16 48 2 W							
			Aug 18, 24			11 0	4 25 9 N			16		D&C
Sanoye	6 58 6 N	350 01	Jul 4, 24	10 5,13 8	16 58 4 W	18 0	3 11 2 N				223 1256	D&C
			Jul 5, 24	9 7,14 4	16 55 8 W					16	223 1256	LCD
			Jul 6, 24					12 4,14 4	30934	16		LCD
			Jul 19, 24			11 1	3 19 2 N				223 1256	LCD
			Jul 21, 24	6 9, 8 1,16 9	16 57 7 W	10 0	3 03 6 N				223 1256	LCD
			Jul 21 24	8 5 to 14 5 (dv)	16 58 7 W			8 5 to 14 5 (dv)	30896	16		LCD
										16		LCD
Robert Port (Cape Mount)	6 45 3 N	348 38	Sep 3, 23	13 3,16 6	16 59 6 W			14 0,15 6	31024	16		LCD
			Sep 4, 23			16 9	3 25 8 N				223 1256	LCD
Bushrod Island (Monrovia)	6 21 5 N	349 12	Jun 23, 23	13 8	17 41 3 W					16		D&B
			Jun 24 23	11 1,15 0	17 39 4 W	17 4	3 19 4 N	12 1,14 3	30789	16	223 1256	D&B
Greenville (Sinu)	5 00 0 N	350 05	Dec 11, 24	11 0,13 3	17 26 6 W			11 9,12 9	30736	16		LCD
			Dec 12, 24			11 6	1 27 7 S				223 1256	LCD
			Dec 16, 24	9 7 ,11 6	17 24 5 W	14 2	1 21 1 S	10 3,11 2	30734	16	223 1256	LCD
Cuttington, *A**	4 23 3 N	352 19	Aug 14, 26	15 8,17 1	17 05 8 W	14 8,15 0	5 21 8 S	16 1,16 8	30284	26	EI 26	JES
			Aug 16, 26	9 4,10 6	17 05 4 W	9 0, 9 2	5 22 3 S	9 8,10 4	30321	26	EI 26	JES
Cuttington, *B**	4 23 3 N	352 19	Aug 17, 26	14 4,16 5	16 55 4 W	9 2, 9 4	4 53 4 S	15 6,16 2	30218	26	EI 26	JES
			Aug 19, 26			6 4 to 17 4 (dv)	4 52 5 S				EI 26	JES

* Local disturbance

AFRICA

LIBERIA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Cuttington, B*—*Concluded*	4 23 3 N	352 19	Aug 21, '26	6 6 to 17 7 (dv)	16 51 7 W			6 6 to 17 7 (dv)	30266	26		JES
Harper*	4 22 2 N	352 16	Sep 1, 26	15 4,16 7	16 54 4 W	14 7,14 9	4 24 4 S	15 7,16 4	30394	26	EI 26	JES
			Sep 2, 26	9 0,10 2	16 55 2 W	8 4, 8 6	4 25 4 S	9 3, 9 9	30434	26	EI 26	JES
Cape Palmas, *C**	4 22 2 N	352 16	Sep 9, 26	16 1,17 4	17 28 1 W	15 0,15 2	5 30 6 S	16 5,17 1	31058	26	EI 26	JES
Cape Palmas, *A**	4 21 6 N	352 16	Aug 27, 26	15 2	16 46 2 W			15 6	29089	26		JES
			Aug 30, 26	8 9,10 3	16 43 5 W	10 9,11 1	4 43 4 S	9 2, 9 9	29118	26	EI 26	JES
			Aug 30, 26	13 6,14 8	16 46 3 W	13 0,13 2	4 43 7 S	13 9,14 5	29110	26	EI 26	JES
Cape Palmas, *B**	4 21 6 N	352 16	Aug 25, 26	16 4,17 5	18 50 9 W	15 7,15 9	5 25 2 S	16 6,17 2	28029	26	EI 26	JES

MOROCCO

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Tangier, *A*	35 47 8 N	354 08	Jul 7, '25	14 3,15 8	13 05 2 W	16 9,17 2	52 51 0 N	14 6,15 4	25373	26	EI 26	JES
Larache, *B* (El Araish)	35 12 5 N	353 50	Jul 10, 25	8 3,10 4	13 05 5 W	11 1,11 3	51 49 0 N	9 2,10 0	25851	26	EI 26	JES
Larache, *C* (El Araish)	35 12 5 N	353 50	Jul 10, 25	13 3,15 1	13 07 4 W			13 7,14 7	25646	26		JES
Rabat	34 01 5 N	353 10	Jul 16, 25	14 0,15 6	13 14 4 W	16 9,17 1	50 50 9 N	14 4,15 2	26100	26	EI 26	JES
			Jul 17, 25	8 8,10 2	13 12 7 W	10 8,11 0	50 56 4 N	9 2, 9 8	26090	26	EI 26	JES
			Jul 17, 25			11 2	50 58 2 N				EI 26	JES
Casablanca (Dar el Baida)	33 34 2 N	352 23	Jul 30, 25	17 2,18 6	13 30 1 W							
Marakech *A*	31 37 0 N	352 00	Jul 20, 25	13 3,15 0	13 32 1 W	15 8,16 0	47 50 3 N	17 6,18 3	26265	26		JES
			Jul 21, 25	6 0 to 18 1 (dv)	13 29 4 W			13 7,14 6	27108	26	EI 26	JES
			Jul 24, 25					6 0 to 18 1 (dv)	27083	26		JES
Marakech, *B*	31 37 0 N	352 00	Jul 22, 25	9 3,13 9,15 6	13 29 0 W	6 3 to 18 7 (dv)	47 51 6 N				EI 26	JES
Mogador	31 31 9 N	350 16	Jul 27, 25	13 4,16 0	14 16 6 W	16 4,16 6	47 43 3 N	14 3,15 2	27092	26	EI 26	JES
			Jul 28, 25	9 0, 9 2	14 10 0 W	15 6,15 8	48 18 2 N	13 8,14 6	26928	26	EI 26	JES
			Jul 28, 25	10 7,10 9	14 13 0 W	11 4,11 6	48 13 5 N	9 6,10 4	26937	26	EI 26	JES
										26		JES

NIGERIA

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kano, *A*	12 01 0 N	8 33	Dec 22, '26	9 0,10 2	8 20 7 W	10 6,10 8	5 56 8 N	9 4, 9 9	32731	26	EI 26	JES
			Dec 23, 26									
			Dec 27, 26	7 2 to 17 4 (dv)	8 22 7 W	6 8 to 17 0 (dv)	6 00 6 N				EI 26	JES
Kano, *B*	12 00 6 N	8 33	Dec 21, 26	9 5,11 3	8 30 1 W	11 6,11 8	6 08 9 N	7 2 to 17 4 (dv)	32648	26		JES
Zaria, *A*	11 06 8 N	7 43	Dec 10, 26	13 6,14 7	8 46 7 W	10 7,10 9	4 13 9 N	10 4,11 0	32782	26	EI 26	JES
			Dec 10, 26			15 8,16 0	4 14 5 N	13 9,14 4	32712	26	EI 26	JES
			Dec 11, 26	8 4, 9 5	8 43 6 W						EI 26	JES
Zaria, *B*	11 06 8 N	7 43	Dec 11, 26	13 5,14 6	8 46 0 W	11 1,11 2	4 13 6 N	8 6, 9 2	32692	26		JES
Yola, *A*	9 16 3 N	12 28	Nov 1, 26	15 1,16 3	7 34 8 W	10 3,10 5	0 57 9 S	13 8,14 3	32690	26	EI 26	JES
Yola, *B*	9 16 3 N	12 28	Oct 30, 26	10 0,11 4	7 37 3 W	15 7,15 8	0 57 4 S	15 4,16 0	32778	26	EI 26	JES
Jebba, *A*	9 07 7 N	4 49	Dec 4, 26	13 4,14 5	10 12 9 W	16 4,16 6	0 08 0 N	10 5,11 1	32820	26	EI 26	JES
			Dec 5, 26	9 3,10 5	10 11 4 W	7 5, 7 6	0 10 0 N	13 7,14 2	32140	26	EI 26	JES
Jebba, *B*	9 07 7 N	4 49	Dec 6 26	10 0,11 1	10 05 4 W	8 9, 9 1	0 10 8 N	9 6,10 2	32186	26	EI 26	JES
Amar	8 40 9 N	10 23	Nov 11 26			5 2, 5 4	1 57 8 S	10 2,10 8	32190	26	EI 26	JES
			Nov 11 26	6 1, 7 4	8 23 5 W						EI 26	JES
Ibi, *A*	8 10 8 N	9 44	Nov 13, 26	15 2,16 8	8 42 1 W	9 1, 9 3	2 55 7 S	6 6, 7 1	32464	26	EI 26	JES
			Nov 14, 26	7 0, 8 0	8 42 2 W	14 0,14 2	2 53 3 S	15 8,16 5	32262	26	EI 26	JES
Ibi, *B*	8 10 8 N	9 44	Nov 15, 26	8 0, 9 1	8 39 6 W	9 4, 9 6	2 54 0 S	7 3, 7 8	32288	26	EI 26	JES
Lokoja, *A*	7 48 3 N	6 44	Nov 23, 26	15 1,16 6	9 53 7 W	13 5,13 7	3 10 8 S	8 3 8 8	32340	26	EI 26	JES
			Nov 24, 26	6 7, 7 8	9 53 8 W	10 4,10 6	3 10 4 S	15 4,16 2	32039	26	EI 26	JES
Lokoja, *B*	7 48 3 N	6 44	Nov 25, 26	9 2,10 3	10 10 6 W	8 7, 8 9	2 50 9 S	7 0, 7 5	32012	26	EI 26	JES
Lagos, *A*	6 26 9 N	3 24	May 16, 26	12 7	11 34 5 W	14 7,14 9	5 28 9 S	9 5,10 0	31747	26	EI 26	JES
Lagos, *B*	6 26 9 N	3 24	May 16, 26	8 6,10 9	11 34 5 W	11 4,11 6	5 26 5 S	14 0	31464	26	EI 26	JES
			May 24, 26					10 0,10 6	31486	26	EI 26	JES
			May 26, 26	6 5 to 17 7(dv)	11 47 9 W	6 8 to 17 3 (dv)	5 30 3 S				EI 26	JES
Lagos, *C*	6 26 9 N	3 24	May 21, 26	13 4,14 5	11 36 6 W	14 9,15 0	5 29 7 S	6 5 to 17 7 (dv)	31451	26		JES
								13 7,14 2	31455	26	EI 26	JES

*Local disturbance

AFRICA

SIERRA LEONE

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Freetown	8 29 7 N	346 44	Sep 4, '25	14 9,16 4	17 40 6 W	17 5,17 7	7 16 8 N	15 3,16 2	31334	26	EI 26	JES
			Sep 5, 25	8 0, 9 5, 9 8	17 37 5 W	10 4,10 6	7 14 7 N	8 4, 9 2	31352	26	EI 26	JES
Moyamba	8 09 2 N	347 32	Sep 14, 25	9 3,10 8	17 06 2 W	12 2,12 4	7 24 7 N	9 7,10 5	30917	26	EI 26	JES
			Sep 14, 25	16 2,17 6	17 06 4 W			16 6,17 3	30920	26		JES
Bo	7 57 8 N	348 11	Sep 10, 25	14 4,16 1,16 4	17 30 1 W	17 0,17 2	6 30 6 N	14 8,15 8	31156	26	EI 26	JES
			Sep 11, 25	8 9,10 8	17 27 6 W	11 4,11 6	6 24 6 N	10 4	31177	26	EI 26	JES

TANGANYIKA TERRITORY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kigoma	4 52 8 S	29 38	Jul 25, '21	10 3,11 6	7 08 8 W	16 5	33 26 6 S	10 7,11 3	28436	13	177 2X(78)	FB
Ujiji	4 55 1 S	29 42	Jul 26, 21	9 6,10 4	7 15 6 W	11 4	33 16 2 S	10 0	28471	13	177 2X	FB
Tabora, *A*	5 01 5 S	32 48	Jul 28, 21	10 3,11 6	6 13 9 W	14 9	33 48 4 S	10 6,11 3	28608	13	177 2X(78)	FB
Tabora, *B*	5 02 3 S	32 49	Jul 29, 21	10 1,11 4	6 13 9 W	15 0	33 53 5 S	10 4,11 1	28630	13	177 2X(78)	FB
Malongwe	5 26 7 S	33 39	Jul 31, 21	10 0,11 3	5 49 2 W	15 9	34 30 2 S	10 4,11 0	28493	13	177 2X(78)	FB
			Aug 1, 21	6 4 to 18 2(dv)	5 48 0 W					13		FB
Saranda	5 42 9 S	35 01	Jul 21, 21	16 3,17 6	5 30 1 W	14 8	35 07 7 S	16 6,17 3	28370	13	177 2X(78)	FB
Kilimatinde	5 51 4 S	34 59	Jul 22, 21	16 4,17 6	5 31 2 W	15 3	35 22 8 S	16 7,17 4	28287	13	177 2X(7)	FB
Masengo	5 52 8 S	34 59	Jul 23, 21	7 3, 8 6	5 36 4 W	10 9	35 10 9 S	7 7, 8 3	28324	13	177 2X(7)	FB
Dodoma	6 11 2 S	35 46	Jul 20, 21	10 2,11 5	5 16 0 W	14 7	35 51 9 S	10 6,11 2	28256	13	177 2X(78)	FB
Ngere Ngere	6 46 1 S	38 06	Aug 3, 21	9 9,11 3	4 59 5 W	16 1	36 40 5 S	10 3,11 0	28071	13	177 2X(78)	FB
Dar-es-Salaam	6 49 0 S	39 18	Jul 13, 21	12 6,14 8	4 28 8 W	11 3	36 40 4 S	13 0,14 4	28144	13	177 2X(78)	FB
			Jul 14, 21	6 0 to 18 1(dv)	4 30 3 W					13		FB
Kilossa	6 50 3 S	37 00	Jul 18, 21	7 4, 9 2	5 14 2 W	10 9	36 44 3 S	7 7, 8 5	27935	13	177 2X(78)	FB

TUNISIA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Tunis	36 45 5 N	10 07	Feb 22, '22	9 3,10 6	7 47 2 W	11 5,11 7	51 55 6 N	9 6,10 3	25790	27	EI 27	WCP
			Feb 22, 22	13 7,15 0	7 48 0 W	13 0,13 2	51 53 5 N	13 0,14 7	25802	27	EI 27	WCP
Sfax	34 43 6 N	10 45	Feb 26, 22	9 2,10 4	7 24 9 W	11 4,11 6	49 11 6 N	9 5,10 2	26816	27	EI 27	WCP
			Feb 26, 22	13 8,15 1	7 26 2 W	13 0,13 3	49 11 6 N	14 2,14 7	26806	27	EI 27	WCP

ASIA

ARABIA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
El Wedj	26 13 0 N	36 28	Feb 3, '22	16 2,17 3	0 14 1 W	15 3,15 5	35 10 6 N	16 4,17 0	31806	27	EI 27	WCP
			Feb 4, 22	7 6	0 13 6 W					27		WCP
Yambo	24 04 7 N	38 03	Feb 2, 22	13 6,14 4	0 04 4 W	13 2	31 15 9 N	13 0	32740	27	EI 27	WCP
Jidda, *B*	21 29 8 N	39 11	Jan 27, 22	10 6,14 4,15 6	0 00 6 W	11 6,11 8	26 33 0 N	14 7,15 3	33601	27	EI 27	WCP
Jidda, *A*	21 28 3 N	39 11	Jan 28, 22	10 4,11 6	0 01 3 W	14 6,14 8	26 34 2 N	10 8,11 4	33644	27	EI 27	WCP
			Jan 30, 22	12 8,14 3	0 01 1 E	15 2,15 4	26 20 6 N	13 2,13 7	33642	27	EI 27	WCP
Aden, *B*, *Royal Indian Marine Station*	12 49 8 N	44 58	Sep 23, 21	7 8, 9 0	0 03 9 W	17 5	7 58 8 N	8 1, 8 7	35304	13	177 2X(78)	FB
Aden, *A**	12 47 2 N	44 59	Aug 31, 21	6 3, 7 6	0 04 7 E	17 6	8 18 4 N	6 7, 7 3	35376	13	177 2X(78)	FB

CHINA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kalgan	40 51 2 N	114 51	Aug 4, '22	8 2, 8 3	3 22 8 W	13 7,18 1	58 33 7 N	9 5,10 1	28103	13	177 2X(78)	FB
			Aug 4, 22	12 6,12 7	3 25 2 W			15 0,15 6	28116	13		FB
Peking, *1907*	39 57 3 N	116 25	Jul 31, 22	10 0,12 3	4 14 4 W	13 4	57 18 5 N	10 8,11 5	28770	13	177 2X(78)	FB
			Aug 1, 22	6 3 to 18 3(dv)	4 12 1 W			6 5 to 18 1 (dv)	28814	13		FB
Peking, *1916*	39 52 5 N	116 23	Jul 29, 22	10 7,11 5	4 24 0 W	12 4,17 5	57 07 4 N	11 0,14.8	28814	13	177 2X(78)	FB
			Jul 29, 22	13 1,13 2	4 25 8 W			15 4	28835	13		FB
Chengchow, *B*	34 44 8 N	113 42	Jul 26, 22	7 0, 7 1	2 41 8 W	6 2,13 6	50 45 6 N	9 1, 9 8	31942	13	177 2X(78)	FB
			Jul 26, 22	12 6,12 8	2 48 2 W			14 7,15 3	31974	13		FB
Chengchow, *A*	34 44 7 N	113 42	Jul 25, 22	9 0,10 2	2 45 2 W	11 4	50 42 8 N	9 3, 9 9	31936	13	177 2X(78)[1]	FB
			Jul 25, 22	14 4,14 6	2 49 0 W					13		FB

* Local disturbance [1] Needle 15X rejected

ASIA

CHINA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Nanking	32 03 8 N	118 48	Jul 17, '22	7 5, 8 2	2 24 0 W	12 3,17 9	46 43 1 N	7 8, 9 5	33041	13	177 2X(78)	FB
			Jul 17, 22	14 2,15 5	2 28 8 W			14 6,15 2	33070	13		FB
Hankow	30 37 0 N	114 20	Jul 21, 22	12 5,13 8	2 07 0 W	13 3,18 0	44 41 6 N	15 0,15 7	34105	13	177 2X(78)	FB
			Jul 22, 22	6 0 to 18 0(dv)	2 04 3 W			6 3 to 17 7 (dv)	34104	13		FB
			Jul 24, 22	7 7, 7 9	2 01 6 W			8 2, 8 9	34114	13		FB
Canton, *A*[2]	23 05 8 N	113 18	*1921* Dec 27	10 2,11 5	0 35 0 W	14 8	31 56 7 N	10 6,11 2	37268	13	177 2X(78)	FB
			1922 Jan 7	9 3	0 36 3 W	11 1	31 55 9 N	9 4	37261	13	177 2X(78)	FB
			Jan 14	10 0	0 34 6 W	16 4	32 01 8 N	10 1	37248	13	177 2X(78)	FB
			Jan 20	14 6	0 35 6 W	16 6	31 58 4 N	14 6	37242	13	177 2X(78)	FB
			Jan 28	9 8	0 34 4 W	11 6	31 55 9 N	9 8	37256	13	177 2X(78)	FB
			Feb 3, 9, 15, 22	15 9,17 2	0 34 7 W	15 0	31 58 5 N	16 2,16 9	37214	13	177 2X(78)	FB
			Mar 1, 8, 15, 22, 28	16 1,17 3	0 35 7 W	15 2	31 55 8 N	16 5,17 0	37234	13	177 2X(78)	FB
			Apr 5,12, 18, 25	16 2,17 3	0 36 2 W	15 2	31 53 8 N	16 5,17 1	37234	13	177 2X(78)	FB
			May 2, 9, 16, 24	16 4,17 8	0 35 8 W	15 4	31 54 0 N	16 8,17 4	37224	13	177 2X(78)	FB
			Jun 6	16 6,18 0	0 37 6 W	15 3	31 53 8 N	17 0,17 7	37214	13	177 2X(78)	FB
			Jun 13, 20	14 9,16 1	0 37 2 W	17 4	31 53 2 N	15 3,15 9	32741	13	177 2X(78)	FB
			Jul 3	16 7,17 8	0 36 8 W	15 5	31 50 9 N	17 1,17 6	37221	13	177 2X(78)	FB
			Jul 4	5 8 to 18 1(dv)	0 36 5 W					13		FB
			Jul 10	6 0 to 9 4(dv)	0 33 5 W			6 2 to 9 5 (dv)	37245	13		FB
			Jul 10	13 4 to 18 3(dv)	0 36 4 W			13 4 to 18 1 (dv)	37264	13		FB
Canton, *B*	23 05 8 N	113 18	Dec 28, 21	10 3	0 37 7 W	9 4	31 56 5 N	10 6	37230	13	177 2X(78)	FB
			Dec 29, 21	11 1	0 38 0 W			10 8	37195	13		FB

INDO-CHINA

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	H.I. LMT	H.I. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Phantiet	10 56 2 N	108 03	Dec 28, '23	9 3,10 7	0 55 6 E	14 4,14 6	5 09 0 N	9 7,10 4	40080	24	EI 24	DGC
			Dec 29, 23	13 6,15 1	0 57 7 E	12 6,12 8	5 08 0 N	14 1,14 8	40045	24	EI 24	DGC
			Dec 30, 23	6 8, 8 0	0 60 2 E			7 1, 7 6	39998	24		DGC
Saigon	10 46 5 N	106 42	Jan 2, 24	9 7,11 0	0 45 4 E	11 4,11 6	4 43 0 N	10 0,10 7	40052	24	EI 24	DGC
			Jan 3, 24	13 0,14 2	0 43 8 E	14 6,14 8	4 42 0 N	13 3,13 9	40106	24	EI 24	DGC
			Jan 4, 24	8 4, 9 6	0 43 2 E	7 8, 8 0	4 42 6 N	8 7, 9 3	40040	24	EI 24	DGC

JAPAN

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	H.I. LMT	H.I. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kakioka Observatory, *A*	36 13 8 N	140 11	Aug 17, '22	10 6,11 6	5 34 0 W			16 2 18 4	29692	13		FB
			Aug 17, 22	11 9,12 1	5 34 0 W					13		FB
			Aug 17, 22	12 4,12 6	5 34 6 W					13		FB
			Aug 18, 22			12 9,13 9	49 23 2 N	6 2, 7 0	29667	13	177 2X(78)	FB
			Aug 18, 22			14 8	49 24 8 N	7 7, 8 4	29680	13	177 2X(78)	FB
Kakioka Observatory, *B*	36 13 8 N	140 11	Aug 13, 22			17 6,18 8	49 22 1 N				177 2X(78)	FB
			Aug 14, 22	11 4,11 7	5 33 6 W	7 3	49 25 0 N	17 6,18 4	29658	13	177 2X(78)	FB
			Aug 14, 22	12 0,12 4	5 34 8 W					13		FB
			Aug 14, 22	12 6,12 9	5 35 2 W					13		FB
			Aug 14, 22	16 7,17 1	5 30 2 W					13		FB
			Aug 15, 22					10 4,11 2	29682	13		FB
			Aug 15, 22					11 8,12 6	29686	13		FB
			Aug 16, 22			18 8	49 23 2 N				177 2X(78)	FB
Kakioka Observatory, *C*	36 13 8 N	140 11	Aug 15, 22	17 0,17 3	5 33 4 W					13		FB
			Aug 15, 22	17 6,17 8	5 34 0 W					13		FB
			Aug 15, 22	18 1,18 3,18 5	5 33 8 W					13		FB
			Aug 16, 22	9 7	5 34 9 W			10 2,10 9	29669	13		FB
			Aug 16, 22					11 5,12 2	29684	13		FB
			Aug 16, 22					13 0,13 8	29674	13		FB

[2] Where several days are grouped in the date column with but single entries of the magnetic elements the values are the means of determinations made at the given local mean times on each day

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 14	78 09 N	106 05	Apr 21, '19			16 9	85 30 2 N				154 12	PK
No 15	78 06 N	106 45	Apr 23, 19			15 5	85 38 6 N				154 1	PK
No 5	77 42 N	103 55	Apr 4, 19			16 6	85 29 5 N	16 6	04578	205	205 123	OW
			Apr 21, 19			16 6	85 23 1 N	16 6	04699	205	205 123	OW
No 16 (Lockwood Is)	77 35 5 N	105 29	Jul 15, 19			15 2	85 32 2 N	15 2	04559	205	205 123	OW
			Jul 15, 19			17 5	85 32 0 N	17 5	04555	205	205 567	OW
No 17 (Fram Island)	77 33 8 N	105 43	Jul 17, 19			15 1	85 32 3 N	15 1	04568	205	205 123	OW
			Jul 17, 19			17 0	85 33 0 N	17 0	04543	205	205 567	OW
No 19	77 33 2 N	105 32	Jul 19, 19			10 4	85 33 1 N	10 4	04536	205	205 123	OW
			Jul 19, 19			12 3	85 33 0 N	12 3	04533	205	205 567	OW
No 4, Winter-Quarters, 1918–1919	77 32 6 N	105 40	Oct 1, 18	11 4	26 16 7 E					8		HUS
			Oct 5, 18	10 8,15 8	26 41 9 E			12 0,16 0	04592	8		HUS
			Oct 7, 18			13 3	85 33 4 N	13 3	04522	205	205 123	HUS
			Oct 10, 18	10 9,16 1	26 09 4 E			12 1,15 1	04537	8		HUS
			Oct 11, 18			11 5	85 33 0 N	11 5	04545	205	205 123	HUS
			Oct 18, 18	11 0,18 0	26 49 0 E			12 2,16 8	04582	8		HUS
			Oct 19, 18			11 7	85 33 9 N	11 6	04545	205	205 123	HUS
			Oct 24, 18			13 4	85 31 6 N	13 4	04559	205	205 123	HUS
			Oct 26, 18	11 1	26 49 4 E			15 4	04533	8		HUS
			Nov 1, 18			13 9	85 31 8 N				205 12	HUS
			Nov 2, 18	10 3	27 07 8 E					8	,	HUS
			Nov 5, 18	11 9	26 45 5 E			15 4,17 8	04606	8		HUS
			Nov 13, 18			16 8	85 30 0 N	16 8	04589	205	205 123	HUS
			Nov 19, 18			11 6	85 29 1 N	11 7	04605	205	205 123	HUS
			Nov 22, 18			15 7	85 31 8 N	15 7	04561	205	205 123	RA
			Nov 25, 18			10 8	85 30 9 N	10 8	04574	205	205 123	RA
			Nov 26, 18					11 8,16 6	04564	8		HUS
			Nov 27, 18			11 0	85 30 4 N	11 0	04599	205	205 123	RA
			Nov 28, 18			10 8	85 29 5 N	10 8	04614	205	205 123	RA
			Nov 29, 18			10 5	85 32 7 N	10 5	04548	205	205 123	RA
			Nov 30, 18			10 7	85 31 4 N	10 7	04569	205	205 123	RA
			Dec 2, 18			10 9	85 31 7 N	10 9	04580	205	205 356	RA
			Dec 2, 18	12 3	26 37 4 E					8		RA
			Dec 3, 18	10 4,16 2	27 01 0 E			11 5,15 5	04533	8		RA
			Dec 4, 18			10 9	85 31 5 N	10 8,15 7	04618	205	205 127	RA
			Dec 4, 18	16 8	26 24 1 E	15 7	85 28 5 N			8	205 567	RA
			Dec 5, 18	10 0,15 1	26 43 2 E	11 1	85 30 8 N			8	205 123	RA
			Dec 5, 18			16 2	85 33 6 N	11 1	04574	205	205 567	RA
			Dec 6, 18	10 2,16 4	26 42 8 E			11 0,15 7	04567	8		RA
			Dec 7, 18			11 2	85 30 4 N	10 8,11 7	04579	205	205 123	RA
			Dec 7, 18			11 4	85 31 2 N				205 567	RA
			Dec 9, 18			10 9	85 29 9 N	10 9,15 8	04580	205	205 123	RA
			Dec 9, 18	12 0,16 9	27 18 2 E	15 7	85 30 5 N			8	205 567	RA
			Dec 10, 18			11 2	85 32 3 N	11 3,16 0	04594	205	205 127	RA
			Dec 10, 18	12 3	26 23 2 E	15 6	85 26 7 N			8	205 567	RA
			Dec 11, 18	14 4	26 23 2 E					8		RA
			Dec 12, 18			11 0,12 4	85 29 7 N	11 0,12 4	04608	205	205 123	RA
			Dec 12, 18			15 4,16 7	85 30 4 N	15 4,16 7	04604	205	205 567	RA
			Dec 12, 18	14 4,17 5	26 37 9 E					8		RA
			Dec 13, 18	9 9,12 6	26 24 2 E					8		RA
			Dec 13, 18			11 5	85 31 1 N	11 5	04567	205	205 123	RA
			Dec 13, 18	14 7,16 8	26 30 6 E					8		RA
			Dec 14, 18	9 8,12 7	26 33 6 E			10 6,12 1	04572	8		RA
			Dec 16, 18	9 8,12 4	26 38 7 E			10 5,11 8	04566	8		RA
			Dec 16, 18			15 5	85 31 2 N	15 5	04581	205	205 127	RA
			Dec 16, 18			16 8	85 32 3 N	16 8	04547	205	205 356	RA
			Dec 17 18	9 7,12 5	26 36 8 E			10 4,11 8	04559	8		RA
			Dec 17, 18			15 4	85 31 6 N	15 4	04559	205	205 356	RA
			Dec 17, 18			16 8	85 28 9 N	16 8	04601	205	205 127	RA
			Dec 18, 18	9 8,12 5	26 33 6 E			10 5,11 9	04558	8		RA
			Dec 18, 18			15 4	85 29 5 N	15 4	04594	205	205 123	RA
			Dec 18, 18			16 8	85 28 0 N	16 8	04637	205	205 567	RA
			Dec 19, 18	9 7,12 4	26 35 8 E			10 4,11 8	04608	8		RA
			Dec 19, 18			15 8	85 31 2 N	15 8	04533	205	205 123	RA
			Dec 19, 18			15 8	85 35 4 N	15 8	04512	205	205 567	RA
			Dec 20, 18	9 7,12 4	26 53 5 E			10 4,11 8	04568	8		RA
			Dec 20, 18			15 1	85 30 7 N	15 1	04577	205	205 123	RA
			Dec 20, 18			16 7	85 30 5 N	16 7	04614	205	205 567	RA
			Dec 21, 18	9 7,12 6	26 46 1 E			10 4,12 0	04560	8		RA
			Dec 23, 18	9 8	26 58 4 E			10 5,12 0	04527	8		RA
			Dec 23, 18	15 7,15 9	26 32 2 E					8		RA
			Dec 23, 18	16 1,16 3	26 08 5 E					8		RA

[1] For Siberia the Table of Results includes, in addition to values determined during the years 1921–1926, the values determined during 1918–1920 obtained by the members of the *Maud* Expedition, the observations for these data were not in hand at the time of publication of Volume IV giving land magnetic results for 1913–1920

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 4, Winter-Quarters, 1918-1919—*Continued*	77 32 6 N	105 40	Jan 2, '19			11 2	85 32 8 N	11 3	04540	205	205 123	RA
			Jan 8, 19			16 3	85 30 2 N				205 1	RA
			Jan 9, 19			15 8	85 33 3 N				205 12	OW
			Jan 10, 19			16 3	85 34 3 N				205 12	HH
			Jan 14, 19			16 0	85 30 2 N	16 9	04578	205	205 123	S&W
			Jan 15, 19	10 5,10 7	26 49 0 E	15 9	85 31 6 N			8	205 12	A&H
			Jan 16, 19			16 1	85 31 0 N	16 1	04605	205	205 567	S&W
			Jan 17, 19	9 2	28 01 4 E			11 1	04519	8		A&S
			Jan 17, 19			16 4	85 31 0 N	16 2	04573	205	205 3	HH
			Jan 20, 19	10 6	26 19 8 E					8		RA
			Jan 20, 19			16 4	85 32 7 N	16 7	04545	205	205 123	OW
			Jan 21, 19	9 8,11 0	26 50 8 E					8		RA
			Jan 21, 19			16 3	85 30 4 N	16 5	04590	205	205 567	HH
			Jan 22, 19			15 2	85 32 3 N				205 12	OW
			Jan 23, 19	9 9	26 20 2 E					8		HUS
			Jan 24, 19	10 2,12 6	26 34 6 E					8		RA
			Jan 24, 19			15 1	85 36 0 N	15 1	04481	205	205 3	HH
			Jan 25, 19			12 8	85 35 7 N	12 8	04510	205	205 7	W&H
			Jan 27, 19	10 5,10 7,10 9	26 36 4 E					8		RA
			Jan 27, 19	11 1 11 3,11 5	26 39 7 E					8		RA
			Jan 27, 19			16 2	85 34 6 N	16 2	04523	205	205 356	OW
			Jan 28, 19	9 8,12 3	26 34 0 E			10 5,11 8	04561	8		RA
			Jan 28, 19			16 0	85 33 5 N	16 1	04547	205	205 127	OW
			Jan 29, 19	10 1,10 3	26 28 4 E					8		RA
			Jan 30, 19	9 9,10 1	26 39 0 E					8		RA
			Jan 31, 19	9 8,12 2	26 41 1 E			10 4,11 7	04526	8		RA
			Jan 31, 19			16 1	85 31 7 N	16 1	04583	205	205 567	OW
			Feb 1, 19	10 3	26 48 3 E					8		RA
			Feb 3, 19	11 9	26 20 4 E					8		RA
			Feb 3, 19			16 1	85 31 5 N	16 1	04553	205	205 356	W&H
			Feb 4, 19			16 1	85 33 6 N	16 1	04545	205	205 127	W&H
			Feb 5, 19	10 1	26 41 6 E					8		RA
			Feb 5, 19			16 1	85 33 1 N	16 1	04561	205	205 567	W&H
			Feb 6, 19	10 0,10 2	26 43 8 E					8		RA
			Feb 6, 19			15 3	85 33 4 N	15 3	04544	205	205 127	HUS
			Feb 7, 19	10 1,10 2	26 32 9 E					8		RA
			Feb 7, 19			15 7	85 32 2 N	15 8	04554	205	205 123	OW
			Feb 10, 19			16 0	85 32 1 N	16 0	04570	205	205 567	HH
			Feb 11, 19			15 8	85 32 0 N	15 9	04562	205	205 123	OW
			Feb 12, 19	10 0,12 7	26 46 1 E			10 8,12 1	04548	8		HUS
			Feb 12, 19			16 0	85 34 0 N	16 1	04533	205	205 127	HH
			Feb 13, 19			16 2	85 29 1 N	16 2	04593	205	205 356	OW
			Feb 14, 19			16 1	85 29 0 N	16 2	04611	205	205 567	HH
			Feb 17, 19			15 9	85 29 2 N	16 0	04607	205	205 356	OW
			Feb 18, 19			15 9	85 29 5 N	15 9	04613	205	205 123	HH
			Feb 19, 19			15 8	85 33 2 N	15 8	04547	205	205 567	OW
			Feb 20, 19	14 8,17 6	26 25 0 E			15 5,17 0	04602	8		HUS
			Feb 21, 19			15 7	85 28 3 N	15 7	04678	205	205 123	HH
			Feb 24, 19			15 7	85 32 0 N	15 7	04564	205	205 567	OW
			Feb 25, 19			15 6	85 32 6 N	15 7	04579	205	205 3	HH
			Feb 26, 19			15 7	85 31 0 N	15 7	04587	205	205 567	OW
			Feb 27, 19			11 2	85 31 5 N	11 2	04601	205	205 127	HH
			Feb 27, 19	14 9,17 9	26 09 2 E			15 6,17 1	04648	8		HUS
			Feb 28, 19			16 0	85 28 8 N	16 1	04601	205	205 356	OW
			Mar 3, 19			11 3	85 31 4 N	11 5	04574	205	205 127	HH
			Mar 5, 19			16 1	85 30 1 N	16 2	04584	205	205 356	OW
			Mar 6, 19			15 8	85 32 6 N	15 7	04549	205	205 567	HH
			Mar 7, 19			15 9	85 33 5 N				154 12	HUS
			Mar 11, 19	9 7,12 8	26 40 4 E			10 4,12 1	04538	8		HUS
			Mar 12, 19			11 4	85 36 0 N				154 12	OW
			Mar 13, 19			16 3	85 33 4 N				151 12	HH
			Mar 14, 19	16 4,16 6	26 38 2 E	11 5	85 33 6 N			8	154 12	S&W
			Mar 17, 19			10 8	85 42 4 N				154 12	HH
			Mar 18, 19			10 5	85 36 1 N				154 12	OW
			Mar 19, 19			11 0	85 34 6 N				154 12	HH
			Mar 20, 19	9 7	28 18 8 E	10 4	85 30 5 N			8	154 12	HUS
			Mar 21, 19			10 8	85 41 0 N				154 12	HH
			Mar 24, 19	10 2,12 7	26 53 6 E			10 8,12 1	04510	8		HUS
			Mar 25, 19			10 8	85 32 8 N				154 12	HH
			Mar 27, 19	14 5*,17 2	26 25 4 E			15 3,16 6	04544	8		HUS
			Apr 4, 19	14 3,17 0	26 35 2 E			15 0,16 4	04758	8		RA
			Apr 7, 19	14 7,17 4	26 26 0 E			15 6,16 3	04692	8		RA
			Apr 9, 19	14 9,17 4	25 53 1 E			15 6,16 9	04646	8		RA
			Apr 11, 19	14 7,17 0	26 20 4 E			15 3,16 5	04650	8		RA

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	°		h h h	° ′	h h	° ′	h h	c g s			
No 4, Winter-Quarters 1918-1919—*Concluded*	77 32 6 N	105 40	Apr 14, '19	14 5,17 0	26 33 4 E			15 1,16 4	04532	8		RA
			Apr 16, 19	14 7,17 0	26 29 0 E			15 3,16 5	04581	8		RA
			Apr 18, 19	15 0,17 2	26 20 4 E			15 6,16 7	04571	8		RA
			Apr 21 19	15 0,17 2	25 58 9 E			15 6,16 7	04632	8		RA
			Apr 24, 19	14 7,16 9	26 25 6 E			15 3,16 4	04542	8		RA
			Apr 28, 19	9 8,12 1	26 38 0 E			10 5,11 6	04524	8		RA
			May 2, 19	9 9	28 23 6 E					8		RA
			May 5, 19	10 1	29 42 7 E					8		RA
			May 7, 19	9 7,12 5	26 49 5 E			10 3,11 3	04519	8		RA
			May 9, 19	9 7,11 9	26 48 4 E			10 3,11 4	04482	8		RA
			May 12, 19	9 8,11 9	26 49 8 E			10 3,11 4	04521	8		RA
			May 14, 19	9 7, 9 9	27 01 0 E					8		RA
			May 16, 19	10 1,12 2	27 06 0 E			10 7,11 7	04558	8		RA
			May 19, 19	9 9	26 53 7 E			10 5,11 5	04518	8		RA
			May 21, 19	9 7,11 8	27 25 8 E			10 3,11 3	04540	8		RA
			May 23, 19	9 8,11 9	26 45 3 E			10 4,11 4	04521	8		RA
			May 26, 19	9 9,12 3	27 22 1 E			10 5,11 7	04505	8		RA
			May 28, 19	9 8,12 3	26 48 8 E			11 0	04497	8		RA
			May 30, 19	9 8,12 0	26 52 0 E			10 4,11 4	04506	8		RA
			Jun 3, 19	9 7,12 2	26 51 4 E			10 3,11 5	04482	8		RA
			Jun 6, 19	9 8,11 9	26 44 7 E			10 4,11 4	04493	8		RA
			Jun 10, 19	9 9,12 3	27 15 3 E			10 5,11 7	04534	8		RA
			Jun 13, 19	9 7,12 0	26 48 6 E			10 2,11 4	04496	8		RA
			Jun 17, 19	9 5,11 6	26 59 6 E			10 1,11 0	04512	8		RA
			Jun 20, 19	9 7,11 8	26 59 0 E			10 3,11 3	04492	8		RA
			Jun 24, 19	9 8,12 0	27 11 2 E			10 4,11 4	04636	8		RA
			Jun 27, 19	10 0,12 2	26 50 3 E			10 5,11 6	04496	8		RA
			Jul 1, 19	9 9,12 0	26 55 0 E			10 4,11 5	04510	8		RA
			Jul 3, 19	14 4,16 5	25 33 0 E			15 0,16 0	04560	8		RA
			Jul 8, 19	14 5,16 7	26 07 6 E			15 0,16 1	04654	8		RA
			Jul 11, 19	10 0,12 2	26 48 8 E			10 6,11 6	04510	8		RA
			Jul 12, 19	9 8,12 0	26 44 7 E			10 4,11 5	04548	8		RA
			Jul 15, 19	14 8,17 0	26 25 8 E			15 4,16 4	04526	8		RA
			Jul 17, 19	14 8,17 0	25 57 6 E			15 4,16 4	04548	8		RA
			Jul 18, 19	14 9,17 1	25 49 0 E			15 5,16 6	04678	8		RA
			Jul 19, 19	9 4,11 5	27 16 8 E			10 0,11 1	04484	8		RA
			Jul 21, 19	14 3,16 5	26 32 4 E			14 9,16 0	04492	8		RA
			Jul 22, 19	14 6,16 9	25 37 6 E			15 2,16 4	04712	8		RA
			Jul 25, 19	9 9	26 58 3 E			10 2	[1] 04495	8		RA
			Jul 29, 19	9 6,11 8	26 40 9 E			10 1,11 3	04490	8		RA
			Jul 31, 19	14 6,16 9	26 09 1 E			15 2,16 4	04576	8		RA
			Aug 6, 19	14 9,17 0	26 22 2 E			15 4,16 5	04532	8		RA
			Aug 11, 19	9 8	27 14 5 E					8		RA
No 4*b*, Winter-Quarters 1918–1919	77 32 6 N	105 40	Mar 7, 19			16 2	85 33 9 N				205 12	OW
			Mar 10, 19			11 6	85 33 9 N	11 6	*04528*	*205*	205 567	HH
			Mar 11, 19			11 5	85 33 3 N	11 5	*04538*	*205*	205 127	OW
			Mar 12, 19			11 6	85 32 5 N	11 7	*04548*	*205*	205 356	HH
			Mar 13, 19			16 2	85 32 2 N	16 2	*04567*	*205*	205 127	OW
			Mar 14, 19			11 3	85 31 3 N	11 3	*04570*	*205*	205 356	HH
			Mar 17, 19			11 3	85 39 9 N	11 3	*04427*	*205*	205 127	OW
			Mar 18, 19			11 4	85 34 0 N	11 4	*04519*	*205*	205 356	HH
			Mar 19, 19			11 6	85 34 0 N	11 6	*04531*	*205*	205 127	OW
			Mar 20, 19			11 2	85 33 2 N	11 2	*04545*	*205*	205 567	HH
			Mar 21, 19			11 5	85 39 0 N	11 5	*04437*	*205*	205 127	OW
			Mar 24, 19			11 5	85 35 2 N	11 4	*04514*	*205*	205 567	HH
			Mar 25, 19			11 4	85 33 6 N				205 12	OW
			Mar 27, 19			15 7	85 33 3 N	15 7	*04556*	*205*	205 127	HH
			Apr 4, 19			15 8	85 35 6 N				154 12	HUS
			Apr 7, 19			15 7	85 27 6 N				154 12	HUS
			Apr 9, 19			16 2	85 28 0 N				154 12	HUS
			Apr 11, 19			16 6	85 27 1 N				154 12	HUS
			Apr 14, 19			15 3	85 33 6 N				154 12	HUS
			Apr 16, 19			16 6	85 31 0 N				154 12	PK
			Apr 24, 19			16 1	85 33 5 N	16 0	*04538*	*205*	205 567	OW
			Apr 28, 19			11 3	85 33 9 N	11 4	*04530*	*205*	205 127	OW
No 4*c*, Winter-Quarters 1918–1919	77 32 6 N	105 40	Apr 28, 19			11 4	85 35 0 N				154 12	PK
			May 28, 19			11 5	85 34 5 N	11 5	*04522*	*205*	205 567	OW
			May 30, 19			11 1	85 35 2 N	11 1	*04500*	*205*	205 123	OW
			Jul 11, 19			11 1	85 33 9 N	11 1	*04524*	*205*	205 128	OW
			Jul 12, 19			10 8	85 32 5 N	10 8	*04544*	*205*	205 123	OW
			Jul 12, 19			12 7	85 32 4 N	12 7	*04552*	*205*	205 567	OW

[1] Oscillations only

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
No 4c, Winter-Quarters 1918-1919-*Concluded*	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
	77 32 6 N	105 40	Jul 22, '19			15 2	85 26 7 N	15 1	*04647*	*205*	205 123	OW
			Jul 22, 19			17 0	85 21 7 N	17 0	*04714*	*205*	205 567	OW
			Jul 25, 19			10 3	85 35 2 N	10 2	*04503*	*205*	205 123	OW
			Jul 29, 19			10 3	85 35 7 N	10 4	*04495*	*205*	205 123	OW
			Jul 29, 19			11 9	85 34 0 N	11 9	*04513*	*205*	205 567	OW
			Aug 6, 19			15 7	85 32 5 N	15 7	*04543*	*205*	205 567	OW
No 20	77 32 1 N	105 45	Jul 21, 19			14 9	85 29 6 N	14 9	*04622*	*205*	205 123	OW
			Jul 21, 19			16 7	85 30 8 N	16 7	*04597*	*205*	205 567	OW
No 6	77 32 N	102 44	Apr 7, 19			16 7	85 25 5 N	16 7	*04673*	*205*	205 567	OW
No 18	77 30 2 N	105 34	Jul 18, 19			15 3	85 00 7 N	15 3	*05131*	*205*	205 123	OW
			Jul 18, 19			17 4	84 59 3 N	17 4	*05129*	*205*	205 567	OW
No 8	77 16 N	101 45	Apr 19, 19			16 0	85 09 4 N	16 0	*04967*	*205*	205 567	OW
No 13	77 05 N	106 21	May 24, 19			10 6	85 24 0 N	10 6	*04712*	*205*	205 123	OW
No 12	76 43 N	107 03	May 21, 19			11 1	85 15 5 N	11 1	*04863*	*205*	205 567	OW
No 9	76 34 N	102 47	May 14, 19			11 4	84 59 7 N	11 5	*05125*	*205*	205 123	OW
No 7	76 32 N	101 15	Apr 14, 19			16 9	85 03 0 N	16 9	*05072*	*205*	205 123	OW
No 11	76 31 N	106 13	May 20, 19			11 8	85 15 6 N	11 8	*04856*	*205*	205 123	OW
No 10	76 05 N	104 11	May 16, 19			11 4	85 03 5 N	11 4	*05070*	*205*	205 567	OW
No 3 (Port Dickson)	73 30 2 N	80 26	Sep 2, 18	12 5,20 2	28 41 E			16 5,19 3	07512	8		HUS
			Sep 3, 18	18 2	28 48 E	19 4	82 37 7 N	20 0	*07485*	*205*	205 123	HUS
No 360	70 43 8 N	162 30	Oct 2, 24	15 8	0 13 4 W					8		HUS
			Oct 3, 24	10 5,10 7,11 0	0 11 4 W					8		FM
			Oct 3, 24	11 3,11 8,12 0	0 14 4 W					8		FM
			Oct 3, 24	14 8,15 1,15 4	0 15 W					*205*		HUS
			Oct 3, 24	15 7,16 0,16 3	0 15 W					*205*		HUS
			Oct 8, 24	12 4	0 14 7 W					8		HUS
			Oct 9, 24			10 3	79 14 0 N	10 2	*10735*	*205*	205 236	OW
			Oct 9, 24	14 5 to								
			Oct 10, 24	14 5 (dv)	0 13 5 W					8		MEx[3]
			Oct 11, 24	9 0,11 2	0 15 1 W			9 6,10 7	10736	8		HUS
			Oct 13, 24	9 5 to								
			Oct 14, 24	9 5 (dv)	0 12 5 W					8		MEx[3]
			Oct 14, 24					11 4,12 4	10744	8		HUS
			Oct 14, 24					14 0,15 0	10750	8		HUS
			Oct 14, 24					15 8,17 0	10764	8		HUS
			Oct 15, 24			9 8	79 14 0 N	9 8	*10747*	*205*	205 236	OW
			Oct 15, 24			11 5	79 13 9 N	11 5	*10748*	*205*	205 236	OW
			Oct 15, 24			15 2	79 12 9 N	15 2	*10765*	*205*	205 236	OW
			Oct 16, 24	9 5 to								
			Oct 17, 24	9 5 (dv)	0 12 6 W					8		MEx[3]
No 360b	70 43 8 N	162 30	Oct 3, 24	10 4,10 6,11 0	0 12 W					*205*		HUS
			Oct 3, 24	11 3,11 8,12 0	0 12 W					*205*		HUS
			Oct 3, 24	14 8,15 1,15 4	0 15 4 W					8		FM
			Oct 3, 24	15 7,16 0,16 3	0 14 5 W					8		FM
No 360c	70 43 8 N	162 30	Oct 14, 24			11 6	79 14 6 N	11 6	*10739*	*205*	205 236	OW
			Oct 14, 24			14 5	79 14 6 N	14 4	*10734*	*205*	205 236	OW
			Oct 14, 24			16 2	79 13 0 N	16 2	*10767*	*205*	205 236	OW
			Oct 15, 24					9 4,10 3	10756	8		HUS
			Oct 15, 24					11 1,12 1	10747	8		HUS
			Oct 15, 24					14 6,15 5	10754	8		HUS
No 360d	70 43 2 N	162 25	Nov 13, 24			15 1	79 06 6 N	15 1	*10846*	*205*	205 236	OW
			Nov 14, 24	9 5 to 16 5(dv)	0 18 4 W					8		S&M
			Nov 20, 24			11 5	79 06 0 N	11 4	*10879*	*205*	205 236	OW
			Nov 21, 24	12 7	0 13 3 W					8		HUS
			Nov 22, 24	10 4,12 6	0 15 1 W			11 0,12 0	10865	8		HUS
			Nov 25, 24	11 5	0 22 5 W					8		FM
			Nov 26, 24	12 6	0 16 5 W					8		HUS
			Nov 27, 24	11 6	0 15 3 W					8		FM
			Nov 28, 24			12 1	79 07 6 N	12 0	*10850*	*205*	205 236	OW
			Dec 1, 24	9 8	0 15 3 W					8		FM
			Dec 3, 24	12 8	0 17 1 W					8		FM
			Dec 4, 24			11 3	79 06 4 N	11 3	*10872*	*205*	205 236	OW
			Dec 4, 24	12 8	0 16 7 W					8		HUS
			Dec 5, 24	12 8	0 15 4 W					8		FM
			Dec 6, 24	10 1,12 4	0 14 6 W			10 6,11 8	10857	8		HUS
			Dec 8, 24	12 7	0 15 2 W					8		FM
			Dec 9, 24	12 6	0 13 5 W					8		HUS
			Dec 10, 24	12 8	0 14 1 W					8		FM
			Dec 11, 24	12 2	0 10 8 W					8		HUS
			Dec 12, 24			11 1	79 07 9 N	11 1	*10845*	*205*	205 36(3)	OW
			Dec 12, 24	12 7	0 26 4 W					8		FM
			Dec 13, 24	12 9	0 15 9 W					8		FM
			Dec 15, 24	12 5	0 15 7 W					8		FM
			Dec 16, 24	14 7	0 14 1 W					8		FM

[3] These 24-hour observations were made by all members of the party in turn

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 360d—*Continued*	70 43 2 N	162 25	Dec 17, '24	12 5	0 14 2 W					8		FM
			Dec 18, 24			11 2	79 06 7 N	11 2	*10867*	*205*	205 36(3)	OW
			Dec 18, 24	12 8	0 15 1 W					8		HUS
			Dec 19, 24	12 9	0 15 2 W					8		FM
			Dec 20, 24	12 3	0 19 4 W			10 4,11 8	10864	8		HUS
			Dec 22 24	12 1	0 16 2 W					8		FM
			Dec 23, 24	12 8	0 23 1 W					8		FM
			Dec 25, 24	12 9	0 15 5 W					8		HUS
			Dec 26, 24	12 7	0 14 6 W					8		HUS
			Dec 27, 24	12 4	0 13 4 W					8		FM
			Dec 29, 24	12 8	0 12 8 W					8		HUS
			Dec 30, 24	12 4	0 14 7 W					8		FM
			Dec 31, 24	12 6	0 15 3 W					8		HUS
			Jan 1 25	12 4	0 14 8 W					8		HUS
			Jan 2, 25	12 6	0 16 4 W					8		FM
			Jan 3, 25	11 5	0 13 0 W					8		FM
			Jan 5, 25	12 4	0 15 8 W					8		FM
			Jan 6, 25	12 4	0 14 5 W					8		FM
			Jan 7, 25			10 6	79 08 1 N	10 6	*10844*	*205*	205 36(3)	OW
			Jan 7, 25	12 3	0 13 9 W					8		FM
			Jan 10, 25	12 4	0 12 8 W					8		FM
			Jan 11, 25	12 5	0 13 2 W					8		FM
			Jan 13, 25	12 1	0 14 7 W					8		FM
			Jan 14, 25	10 8	0 16 8 W			11 4,12 6	10846	8		HUS
			Jan 15, 25			11 1	79 08 0 N	11 1	*10838*	*205*	205 36(3)	OW
			Jan 15, 25	12 9	0 14 1 W					8		FM
			Jan 17, 25	12 9	0 19 7 W					8		HUS
			Jan 19, 25	12 2	0 28 1 W					8		FM
			Jan 20, 25	12 9	0 38 0 W					8		FM
			Jan 21, 25	12 8	0 13 6 W					8		HUS
			Jan 22, 25			11 2	79 08 0 N	11 2	*10840*	*205*	205 36(3)	OW
			Jan 22 25	12 6	0 15 5 W					8		FM
			Jan 23, 25	12 5	0 13 5 W					8		FM
			Jan 24, 25	12 0	0 20 2 W					8		FM
			Jan 26, 25	14 8	0 15 2 W					8		FM
			Jan 27, 25	11 0	0 12 8 W					8		FM
			Jan 28, 25	10 0	0 16 8 W					8		HUS
			Jan 29, 25			10 5	79 08 2 N	10,4	*10845*	*205*	205 36(3)	OW
			Jan 29, 25	14 9	0 14 5 W					8		FM
			Jan 30, 25	11 4	0 16 6 W					8		FM
			Jan 31, 25	9 8,12 0	0 17 6 W			10 4,11 4	10854	8		HUS
			Feb 2, 25	14 7	0 14 9 W					8		FM
			Feb 3, 25	11 6	0 14 4 W					8		FM
			Feb 4, 25	12 6	0 13 4 W					8		FM
			Feb 5, 25			11 2	79 07 7 N	11 3	*10845*	*205*	205 6(3)	OW
			Feb 5, 25	12 8	0 13 8 W					8		FM
			Feb 6, 25	12 9	0 14 2 W					8		FM
			Feb 9, 25	12 3	0 37 7 W					8		FM
			Feb 10, 25	9 5	0 13 2 W					8		FM
			Feb 11, 25	12 6	0 20 1 W					8		FM
			Feb 12, 25	12 8	0 17 2 W					8		FM
			Feb 13, 25			10 8	79 08 6 N	10 8	*10831*	*205*	205 36(3)	OW
			Feb 13, 25	14 7	0 19 1 W					8		FM
			Feb 18, 25	10 9,11 1	0 24 8 W					8		FM
			Feb 19, 25			10 6	79 08 5 N	10 6	*10843*	*205*	205 36(3)	OW
			Feb 19, 25	11 9	0 15 8 W					8		FM
			Feb 20, 25	9 9,11 9	0 30 4 W			10 5 11 4	10806	8		HUS
			Feb 21, 25	12 8	0 16 0 W					8		FM
			Feb 23, 25	16 4	0 16 2 W					8		FM
			Feb 24, 25	12 2	0 14 9 W					8		FM
			Feb 25, 25	12 9	0 17 1 W					8		FM
			Feb 26, 25			11 2	79 08 9 N	11 2	*10830*	*205*	205 36(3)	OW
			Feb 27, 25	12 6	0 14 2 W					8		FM
			Feb 28, 25	10 0 12 2	0 12 8 W			10 6,11 7	10855	8		HUS
			Mar 2, 25	12 7	0 09 6 W					8		FM
			Mar 3, 25	12 6	0 10 8 W					8		FM
			Mar 4, 25	12 7	0 11 9 W					8		FM
			Mar 5, 25			10 6	79 08 2 N	10 6	*10834*	*205*	205 36(3)	OW
			Mar 5, 25	12 4	0 14 2 W					8		FM
			Mar 10, 25	8 9	0 17 4 W					8		FM
			Mar 11, 25	9 6	0 14 0 W					8		FM
			Mar 12, 25			10 9	79 08 6 N	10 9	*10830*	*205*	205 36(3)	OW
			Mar 12, 25	12 8	0 18 8 W					8		FM

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 360d—*Concluded*	70 43 2 N	162 25	Mar 13, '25	15 2	0 17 1 W					8		FM
			Mar 14, 25	9 6,11 6	0 12 4 W			10 2,11 1	10840	8		HUS
			Mar 16, 25	14 9	0 18 0 W					8		FM
			Mar 17, 25	14 7	0 17 1 W					8		FM
			Mar 18, 25	15 6	0 17 6 W					8		FM
			Mar 19, 25	17 6	0 14 7 W					8		FM
			Mar 21, 25	11 0	0 13 8 W					8		FM
			Mar 24, 25	12 7	0 13 7 W					8		FM
			Mar 25, 25	10 6	0 10 0 W					8		FM
			Mar 26, 25			10 8	79 08 5 N	10 8	*10837*	*205*	205 36(3)	OW
			Mar 26, 25	12 4	0 15 7 W					8		FM
			Mar 27, 25	12 8	0 10 0 W					8		FM
			Mar 28, 25	9 8,11 7	0 12 2 W			10 3,11 2	10830	8		HUS
			Mar 30, 25	12 3	0 15 9 W					8		FM
			Mar 31, 25	15 0	0 15 5 W					8		FM
			Apr 1, 25	11 6	0 13 0 W					8		FM
			Apr 2, 25	17 1	0 20 4 W					8		FM
			Apr 3, 25			10 7	79 08 3 N	10 7	*10840*	*205*	205 36(3)	OW
			Apr 3, 25	14 9	0 24 7 W					8		FM
			Apr 4, 25	10 6	0 13 2 W					8		FM
			Apr 6, 25	12 5	0 16 2 W					8		FM
			Apr 7, 25	15 7	0 22 2 W					8		FM
			Apr 8, 25	9 4	0 11 6 W					8		FM
			Apr 9, 25	12 4	0 15 2 W					8		FM
			Apr 11, 25	11 7	0 21 1 W					8		FM
			Apr 14, 25	11 8,16 7	0 15 2 W					8		FM
			Apr 16, 25	9 5	0 13 8 W					8		FM
			Apr 16, 25			10 7	79 08 0 N	10 7	*10838*	*205*	205 36(3)	OW
			Apr 17, 25	9 9	0 04 0 W					8		FM
			Apr 18, 25	9 6,11 7	0 11 0 W			10 1,11 1	10830	8		HUS
			Apr 20, 25	12 8	0 14 6 W					8		FM
			Apr 21, 25	12,3	0 16 5 W					8		FM
			Apr 22, 25	12 8	0 17 5 W					8		FM
			Apr 24, 25	17 6	0 16 8 W					8		FM
			Apr 25, 25	8 9	0 07 0 W					8		FM
			Apr 27, 25	17 0	0 16 1 W					8		FM
			Apr 28, 25					15 3	*10860*	*205*		OW
			Apr 29, 25	10 5,12 4	0 15 8 W					8		FM
			Apr 29, 25			15 3	79 07 1 N				205 36(3)	OW
			Apr 30, 25	12 5	0 12 6 W					8		FM
			May 1, 25	11 2	0 14 9 W					8		FM
			May 2, 25	9 4,11 4	0 13 2 W			10 0,10 9	10835	8		HUS
			May 4, 25	9 6	0 05 1 W					8		FM
			May 5, 25	12 9	0 02 3 W					8		FM
			May 6, 25	8 8	0 11 2 W					8		FM
			May 7, 25	15 2	0 16 5 W					8		FM
			May 8, 25	8 9	0 06 2 W					8		FM
			May 9, 25	12 4	0 26 6 W					8		FM
			May 11, 25	8 9	0 07 7 W					8		FM
			May 12, 25	14 8	0 18 7 W					8		FM
			May 13, 25	8 8	0 06 0 W					8		FM
			May 14, 25	10 0,12 0	0 12 4 W			10 5,11 4	10816	8		HUS
			May 14, 25			15 3	79 07 7 N	15 2	*10848*	*205*	205 36(3)	OW
			May 15, 25	8 8	0 07 4 W					8		FM
			May 18, 25	15 2	0 21 1 W					8		FM
			May 19, 25	8 9	0 14 0 W					8		FM
No 360*e*	70 43 2 N	162 25	May 14, 25			10 7	79 10 1 N	10 7	*10818*	*205*	205 36(3)	OW
			May 14, 25					14 9,15 8	10844	8		HUS
No 360*f*	70 43 2 N	162 25	Oct 22, 24	9 5 to 21 5(dv)	0 12 6 W					8		S&M
			Oct 23, 24			15 5	79 05 2 N	15 5	*10889*	*205*	205 236	OW
			Oct 27, 24	12 5 to								
			Oct 28, 24	14 5 (dv)	0 11 2 W					8		MEx[3]
			Oct 31, 24			10 5	79 06 2 N	10 4	*10866*	*205*	205 236	OW
			Nov 4, 24	12 5 to								
			Nov 5, 24	12 5 (dv)	0 10 8 W					8		MEx[3]
			Nov 6, 24			11 7	79 07 5 N	11 7	*10905*	*205*	205 236	OW
			Nov 7, 24					10 9,12 0	10853	8		HUS
			Nov 7, 24	12 5 to								
			Nov 8, 24	12 5 (dv)	0 10 0 W					8		MEx[3]
			Nov 10, 24	12 5 to								
			Nov 11, 24	12 5 (dv)	0 08 9 W					8		MEx[3]
No 32	70 03 N	171 15	Jun 8, 20			12 6	78 20 4 N	12 7	*11580*	*205*	205 356	OW
No 33	69 56 N	170 35	Jun 12, 20			3 0	78 23 3 N	3 0	*11525*	*205*	205 123	OW

[3] These 24-hour observations were made by all members of the party in turn

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)[1]—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 31	69 54 N	173 30	Jun 6, '20			3 4	78 18 0 N	3 4	*11585*	*205*	205 123	OW
No 21 (Ayon Island), Winter-Quarters 1919–1920	69 52 5 N	167 43	Oct 29, 19			11 1	78 20 9 N	11 1	*11583*	*205*	205 123	OW
			Nov 5, 19			11 4	78 21 2 N				205 56	OW
			Nov 12, 19			11 5	78 23 4 N	11 5	*11571*	*205*	205 123	OW
			Nov 19, 19			11 5	78 19 5 N	11 5	*11609*	*205*	205 356	OW
			Jun 18, 20			11 3,12 6	78 21 6 N	11 3	*11551*	*205*	205 12356	OW
No 40 (Ayon Island)	69 51 2 N	167 57	Jun 16, 20	17 1,19 2	3 34 0 E	20 0	78 21 0 N	17 7,18 7	11661	8	154 12	HUS
			Jun 17, 20	12 9,14 9	3 19 0 E	15 8	78 18 4 N	13 5,14 4	11593	8	154 12	HUS
No 30	69 50 N	176 30	Jun 4, 20			3 9	78 07 4 N	3 9	*11741*	*205*	205 356	OW
No 29	69 27 N	178 35	Jun 2, 20			4 3	77 56 0 N	4 3	*11895*	*205*	205 123	OW
No 39	69 00 8 N	167 04	May 7, 20	11 5	2 25 5 E	17 1	77 36 1 N	13 0,14 4	12254	8	154 12	HUS
No 28	68 55 N	180 31	May 31, 20			6 3	77 30 8 N	6 3	*12277*	*205*	205 356	OW
No 37	68 36 7 N	163 45	Apr 11, 20	13 7,16 2	0 16 2 W			14 4,15 7	12384	8		HUS
			Apr 12, 20	10 1,10 3	0 02 6 W	13 3	77 32 4 N			8	154 12	HUS
No 36 (Panteleika)	68 36 1 N	161 55	Apr 1, 20	10 8,14 7	1 17 2 W	17 1	77 49 2 N	12 0,14 0	12033	8	154 12	HUS
			Apr 2, 20	11 9,15 6	1 16 2 W	16 8	77 48 2 N	12 5,14 6	12038	8	154 12	HUS
No 34	68 36 N	166 00	Nov 5, 19					14 5	12296	8		HUS
			Nov 6, 19			14 4	77 33 5 N	10 3,11 6	12304	8	154 12	HUS
No 38	68 34 3 N	165 56	Apr 28, 20	9 0,11 5	1 13 5 E	13 6	77 32 8 N	9 7,10 9	12389	8	154 12	HUS
No 27	68 18 N	182 20	May 27, 20			15 4	77 06 1 N	15 4	*12631*	*205*	205 123	OW
No 35	68 13 6 N	164 52	Dec 24, 19	12 8	0 52 5 E					8		HUS
			Dec 31, 19	10 1,12 9	0 30 5 E[5]			11 8	12732	8		HUS
			Jan 1, 20			12 2	77 08 4 N				154 12	HUS
			Jan 7, 20	11 1	0 49 8 E			11 9	12728	8		HUS
			Jan 21, 20	9 9,12 5	0 46 2 E			10 6,12 0	12734	8		HUS
			Jan 24, 20			10 6	77 10 1 N				154 12	HUS
			Jan 28, 20	11 0,13 6	0 52 0 E	14 8	77 08 4 N	11 6,13 0	12734	8	154 12	HUS
			Feb 4, 20	13 6	0 47 0 E			14 3,15 6	12734	8		HUS
			Feb 11, 20	9 6,14 1	0 54 2 E	15 2	77 10 6 N	10 5,13 5	12740	8	154 12	HUS
			Feb 18, 20	9 9,12 4	0 47 6 E	14 5	77 10 0 N	10 5,11 8	12722	8	154 12	HUS
			Feb 25, 20	10 8,14 0	0 42 0 E			11 4,13 5	12730	8		HUS
			Mar 3, 20	10 0,13 5	0 50 3 E	15 0	77 09 0 N	10 9,12 8	12727	8	154 12	HUS
No 26	67 49 N	184 10	May 25, 20			12 5	76 40 8 N	12 5	*13047*	*205*	205 356	OW
No 25	67 15 N	185 20	May 24, 20			18 3	76 16 5 N	18 3	*13450*	*205*	205 123	OW
No 53 (Pitlekai)	67 06 3 N	186 29	Apr 13, 21	12 7,14 6	15 03 E	13 7	76 26 2 N	13 7	*13213*	*205*	205 123	HUS
No 24	67 01 N	187 45	May 22, 20			15 4	76 12 9 N	15 4	*13409*	*205*	205 356	OW
No 41 (Cape Serdze Kamen), Winter-Quarters 1920–1921	66 53 2 N	188 21	Nov 29, 20					11 5,12 8	13394	8		HUS
			Dec 1, 20			12 0	76 14 0 N	11 7,11 8	*13380*	*205*	205 123	HUS
			Dec 2, 20			11 5	76 13 1 N	11 5	*13411*	*205*	205 123(7)	HUS
			Dec 6, 20			11 9	76 14 1 N	11 9	*13407*	*205*	205 123(7)	HUS
No 41*b* (Cape Serdze Kamen), Winter-Quarters 1920–1921	66 53 0 N	188 21	Jan 7, 21	10 5	16 38 E	12 0	76 15 8 N	12 0	*13346*	*205*	205 123	HUS
			Jan 12, 21	10 7	16 31 E	12 6	76 15 4 N	12 6	*13353*	*205*	205 123(7)	HUS
			Jan 13, 21	11 2	16 36 0 E			11 9,13 4	13352	8		HUS
			Jan 19, 21	10 7,13 8	16 38 E	12 2	76 15 8 N	12 2	*13350*	*205*	205 123(7)	HUS
			Jan 22, 21	10 8,13 4	16 35 0 E			11 4,12 8	13352	8		HUS
			Jan 25, 21	11 2,13 7	16 32 E	12 4	76 15 2 N	12 4	*13354*	*205*	205 123(7)	HUS
No 41*c* (Cape Serdze Kamen)	66 53 0 N	188 21	Apr 26, 21	13 8,16 6	16 39 2 E			14 4,15 8	13344	8		HUS
No 41*d* (Cape Serdze Kamen)	66 53 0 N	188 21	Apr 26, 21	13 5,17 8	16 40 E	15 4	76 16 9 N	15 2	*13330*	*205*	205 123	OW
			Apr 26, 21			16 1	76 16 2 N	16 2	*13339*	*205*	205 56(7)	OW
No 23	66 32 N	189 00	May 18, 20			16 5	76 06 0 N	16 5	*13509*	*205*	205 123	OW
No 51	66 10 N	183 50	Mar 15, 21	12 3	13 29 E	13 0	75 35 7 N	13 0	*13949*	*205*	205 123	HUS
No 22 (Kain-ge-skon)	66 03 N	189 50	Mar 3, 20			11 6	75 36 6 N	11 5	*13929*	*205*	205 123	OW
			Mar 9, 20			12 1	75 37 3 N	12 1	*13925*	*205*	205 356	OW
			Mar 23, 20			12 4	75 35 4 N	12 5	*13969*	*205*	205 123	OW
			Mar 25, 20			15 6	75 38 7 N	15 6	*13899*	*205*	205 123	OW
			Apr 5, 20			15 6	75 34 8 N	15 6	*13975*	*205*	205 123	OW
			Apr 6, 20			12 3	75 38 0 N	12 3	*13899*	*205*	205 356	OW
			Apr 12, 20			11 9	75 37 3 N	12 0	*13922*	*205*	205 123	OW
			Apr 13, 20			11 8	75 36 9 N	11 8	*13924*	*205*	205 356	OW
			Apr 23, 20			13 6	75 35 5 N	13 7	*13937*	*205*	205 123	OW
No 42 (Kain-ge-skon)	66 03 N	189 50	Feb 4, 21	11 0	17 33 E	12 4	75 40 2 N	12 4	*13819*	*205*	205 123	HUS
Kain-ge-skon	66 03 N	189 50	Jun 30, 22	12 5	17 00 E	13 5	75 36 8 N	13 5	*13907*	*205*	205 123	HUS
No 50	65 39 N	183 06	Mar 13, 21			7 5	74 56.5 N	7 5	*14476*	*205*	205 123	S&W
No 49 (Mass-kan)	65 31 2 N	181 25	Mar 8, 21	10 9,12 4	10 09 E	11 7	74 59 2 N	11 7	*14460*	*205*	205 123	S&W

[5] Magnetic storm

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 43 (Yan-dang-ai)	65 30 N	188 55	Feb 9, '21	10 3	15 16 E	11 4	75 09 5 N	11 4	*14266*	*205*	205 123	S&W
No 52	65 28 N	185 55	Mar 29, 21			12 6	75 05 5 N	12 6	*14344*	*205*	205 123	HUS
No 48 (An-ma-la)	65 01 4 N	184 12	Mar 1, 21			11 8	74 15 2 N	11 8	*15106*	*205*	205 123	S&W
			Mar 21, 21	11 4,16 3	11 34 E	14 2	74 16 3 N	13 2	*15076*	*205*	205 125	S&W
			Mar 21, 21			14 2	74 15 5 N	15 2	*15094*	*205*	205 36(7)	S&W
No 44 (Jan-da-ken-nut)	64 54 N	187 25	Feb 14, 21	9 6,11 4	16 04 E	10 5	74 40 1 N	10 5	*14772*	*205*	205 123	S&W
No 47	64 50 N	185 25	Feb 23, 21			12 3	74 26 3 N	12 3	*14905*	*205*	205 123	S&W
No 45 (Nabba-kotta)	64 34 N	187 28	Feb 17, 21			13 9	74 24 9 N	14 0	*14861*	*205*	205 123	S&W
No 46 (Emma Harbor)	64 24 N	186 48	Feb 20, 21	13 1,14 7	14 29 E	13 9	74 13 9 N	13 9	*15040*	*205*	205 123	S&W

STRAITS SETTLEMENTS

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Singapore, *Holland Road*	1 19 0 N	103 47	Nov 29, '21	7 1, 8 3	0 32 2 E	9 4	17 20 2 S	7 4, 8 0	38956	13	177 2X(78)	FB
Singapore, *Botanical Gardens*	1 18 9 N	103 49	Nov 27, 21	10 0,11 3	0 35 2 E	14 8	17 22 6 S	10 4,11 0	38986	13	177 2X(78)	FB
Singapore Observatory	1 16 2 N	103 49	Nov 30, 21	10 2,11 4	0 33 0 E	12 3	17 27 4 S	10 5,11 1	38966	13	177 2X(78)	FB
			Nov 27, 23	11 9,15 7,17 0	0 36 7 E	10 3,10 5	17 33 7 S	16 0,16 7	39024	24	EI 24	DGC
			Nov 28, 23	9 2 10 6	0 35 1 E	11 0,11 2	17 39 2 S	9 6,10 3	39018	24	EI 24	DGC
			Nov 29, 23	14 1,15 4	0 38 1 E	15 7,15 8	17 37 0 S	14 4,15 1	38993	24	EI 24	DGC

SYRIA (INCLUDING PALESTINE)

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Alexandretta	36 34 8 N	36 11	Aug 10, '22	9 4,11 2	0 36 7 E	13 6,13 8	50 47 3 N	9 9,10 8	27102	12	EI 7	PHD
Aleppo	36 13 7 N	37 08	Aug 14, 22	10 1,13 2	1 12 2 E	13 9,14 2	50 36 0 N	11 2,12 7	27246	12	EI 7	PHD
			Aug 15, 22	5 6 to 17 9 (dv)	1 12 9 E							
			Aug 16, 22					5 9 to 17 6 (dv)	27252	12		PHD
						6 0 to 17 9 (dv)	50 35 7 N				EI 7	PHD
Homs	34 43 9 N	36 41	Aug 18, 22	9 8,11 7	0 21 2 E	9 0, 9 2	48 39 2 N	10 3,11 2	28191	12	EI 7	PHD
Damascus	33 30 3 N	36 19	Aug 23, 22	12 6,14 6	0 42 1 E	8 9, 9 2	46 55 2 N	13 2,14 2	28573	12	EI 7	PHD
			Aug 24, 22	8 3,10 2	0 47 5 E	12 7,12 9	46 52 0 N	8 8, 9 8	28562	12	EI 7	PHD
Jerusalem	31 47 8 N	35 13	Sep 1, 22	13 0,15 4	0 03 1 W	10 5,10 8	44 19 6 N	13 5,15 0	29404	12	EI 7	PHD
			Sep 2, 22	6 1 to 10 3 (dv)	0 00 4 W					12		PHD
			Sep 2, 22	14 5 to 18 2 (dv)	0 01 2 W					12		PHD

TURKEY

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Dardanelles	40 06 8 N	26 25	Jun 19, '22	9 4,11 1,11 3	1 26 3 W	14 7,14 9	54 49 4 N	10 0,10 7	25004	12	EI 7	PHD
Afiumkarahissar	38 46 0 N	30 36	Jun 30, 22	10 0	0 31 1 W	7 6, 7 7	53 26 2 N	8 9, 9 6	25798	12	EI 7	PHD
			Jun 30, 22	13 6,15 0	0 42 2 W	13 2,13 4	53 26 8 N	14 0,14 7	25822	12	EI 7	PHD
			Jul 1, 22	6 0 to 18 2 (dv)	0 37 0 W					12		PHD
Smyrna	38 27 8 N	27 12	Jun 23, 22	10 1,11 6	1 57 8 W	14 5,14 6	52 40 9 N	10 4,11 2	26710	12	EI 7	PHD
			Jun 24, 22	5 9, 9 1	1 56 8 W	6 6, 6 7	52 41 4 N	7 9, 8 6	26684	12	EI 7	PHD
			Jun 24, 22	13 6,13 8	2 04 0 W			12 5,13 2	26701	12		PHD
Aidin	37 51 3 N	27 50	Jul 6, 22	8 4, 10 0	1 29 6 W	10 6,10 8	52 20 6 N	8 9, 9 6	26070	12	EI 7	PHD

AUSTRALASIA

AUSTRALIA

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Thursday Island, *B*	10 34 5 S	142 13	Sep 7 '23	16 3,17 6	4 54 2 E			16 6,17 3	36625	24		DGC
			Sep 8, 23	6 5 to 9 0 (dv)	4 50 4 E			6 2 to 9 0 (dv)				
			Sep 8, 23	11 3 to 17 1(dv)	4 52 5 E				36621	24		DGC
			Sep 9, 23	6 3 to 17 2(dv)	4 52 0 E			11 6 to 17 4 (dv)	36669	24		DGC
			Sep 10, 23							24		DGC
						6 7 to 16 7 (dv)	33 39 6 S				EI 24	DGC

AUSTRALASIA

AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Pt Charles Lighthouse	12 23 4 S	130 39	Oct 4, '23	14 8,16 1	3 25 0 E	14 2,14 4	38 18 4 S	15 2,15 8	36057	24	EI 24	DGC
Darwin	12 26 7 S	130 50	Sep 21, 23	11 4,13 3	3 31 8 E	10 8,11 0	38 27 2 S	12 4,13 0	36083	24	EI 24	DGC
			Sep 22, 23	5 8 to 16 6(dv)	3 30 8 E					24		DGC
			Sep 24, 23	5 9 to 16 6(dv)	3 32 6 E			5 6 to 16 8 (dv)	36064	24		DGC
			Oct 2, 23			6 0 to 16 7 (dv)	38 28 3 S				EI 24	DGC
Batchelor	13 03 6 S	131 03	Sep 26, 23	14 7,15 0	3 37 2 E	14 1,14 2	39 22 2 S	15 1,15 8	35732	24	EI 24	DGC
			Sep 27, 23	7 8, 9 3	3 34 9 E	9 7, 9 9	39 25 4 S	8 2, 9 0	35754	24	EI 24	DGC
			Sep 27, 23	14 4,15 7	3 39 2 E	14 0,14 2	39 26 4 S	14 8,15 4	35679	24	EI 24	DGC
Pine Creek	13 49 6 S	131 51	Sep 17, 23	12 0,13 8	3 36 4 E	11 5,11 7	40 22 8 S	13 0,13 6	35714	24	EI 24	DGC
Katherine River	14 26 1 S	132 17	Sep 16, 23	11 4,13 9	3 42 8 E	10 6,10 9	41 32 0 S	11 7,13 5	35414	24	EI 24	DGC
Cooktown	15 28 6 S	145 17	Aug 30, 23	11 0,14 9	5 45 6 E	10 4,10 6	41 22 9 S	11 3,14 6	35258	24	EI 24	DGC
			Aug 31, 23	8 8,10 1	5 43 0 E	10 7,10 9	41 23 0 S	9 1, 9 8	35279	24	EI 24	DGC
			Sep 1, 23	14 3,16 1	5 48 6 E			14 6,15 8	35266	24		DGC
Cairns	16 56 0 S	145 46	Aug 20, 23	15 8,17 0	6 08 7 E	13 3,13 5	43 21 8 S	16 1,16 7	35042	24	EI 24	DGC
			Aug 21, 23	10 3,11 5	6 04 8 E	9 8,10 0	43 23 1 S	10 6,11 2	35066	24	EI 24	DGC
			Aug 22, 23	8 7, 9 8	6 07 6 E	10 3,10 4	43 21 8 S	9 0, 9 6	35087	24	EI 24	DGC
			Aug 23, 23	14 7	6 08 0 E	9 5, 9 6	43 21 6 S	15 0	35069	24	EI 24	DGC
			Aug 24, 23	9 2	6 07 4 E			9 5	35108	24		DGC
Derby	17 17 8 S	123 38	Nov 18, 21	18 4	2 18 4 E					13		FB
Normanton	17 41 4 S	141 06	Aug 6, 23	13 9,15 3	5 22 9 E			14 3,15 1	34318	24		DGC
			Aug 7, 23	8 4,10 0	5 20 2 E			8 8, 9 7	34315	24		DGC
			Aug 8, 23	9 6,13 6	5 20 5 E	8 8	45 20 6 S	13 9,14 6	34332	24	EI 24	DGC
			Aug 8, 23	14 9	5 22 5 E					24		DGC
			Aug 9, 23			8 7, 9 0	45 18 8 S				EI 24	DGC
			Aug 9, 23			13 4	45 18 6 S				EI 24	DGC
Normanton, *Secondary*	17 41 4 S	141 06	Aug 8, 23			15 6,16 0	45 19 0 S				EI 24	DGC
Broome, *A*	17 58 4 S	122 14	Nov 17, 21	5 8, 6 5	1 59 0 E	8 1	48 19 2 S	6 1	33130	13	177 2X[1]	FB
Croydon	18 13 1 S	142 15	Aug 14, 23	13 7,15 2	5 28 6 E	11 4,11 7	45 54 3 S	14 1,14 8	34182	24	EI 24	DGC
Forsayth	18 35 1 S	143 38	Aug 16, 23	11 0,14 4	5 39 7 E	10 4,10 6	46 20 0 S	11 3,14 1	34026	24	EI 24	DGC
Townsville	19 14 6 S	146 50	Jul 10, 23	10 2,11 4	6 29 2 E	9 6, 9 8	46 53 2 S	10 5,11 1	33874	24	EI 24	DGC
			Jul 11, 23	7 2 to 12 2(dv)	6 30 9 E					24		DGC
			Jul 11, 23	13 8 to 17 2(dv)	6 32 8 E					24		DGC
			Jul 12, 23			7 0 to 12 0 (dv)	46 53 9 S				EI 24	DGC
			Jul 12, 23			13 7 to 17 0 (dv)	46 52 8 S				EI 24	DGC
			Jul 13, 23	7 2 to 12 1(dv)	6 30 6 E			7 4 to 12 1 (dv)	33877	24		DGC
			Jul 13, 23	13 6 to 16 9(dv)	6 33 7 E			13 6 to 17 2 (dv)	33860	24		DGC
Port Hedland	20 18 8 S	118 35	Nov 15, 21	15 3,16 5	0 41 3 E	17 5	52 00 4 S	15 6,16 2	31486	13	177 2X[1]	FB
Cloncurry, *A*	20 42 4 S	140 30	Jul 24, 23	14 0,15 4	4 47 0 E	13 4,13 6	49 47 6 S	14 4,15 2	33398	24	EI 24	DGC
			Jul 25, 23	6 6 to 17 5(dv)	4 45 9 E					24		DGC
			Jul 26, 23	6 7	4 45 9 E	7 9 to 17 6 (dv)	49 48 6 S			24	EI 24	DGC
			Jul 27, 23	6 9 to 17 4(dv)	4 46 6 E			6 6 to 17 5 (dv)	33412	24		DGC
Cloncurry, *B*	20 42 4 S	140 30	Jul 28, 23	13 3,14 6	4 09 4 E			13 5,14 3	33641	24		DGC
Richmond	20 43 8 S	143 09	Jul 20, 23	9 5,10 8	5 35 8 E	11 4,11 5	49 25 8 S	9 8,10 5	33144	24	EI 24	DGC
Hughenden	20 50 4 S	144 12	Jul 16, 23	14 0,15 3	6 04 1 E	11 4,11 5	49 23 9 S	14,3,15 0	33064	24	EI 24	DGC
			Jul 17, 23	13 8,15 0	6 03 0 E	15 8,16 0	49 22 2 S	14 1,14 7	33062	24	EI 24	DGC
			Jul 18, 23	9 5,10 6	6 00 8 E	9 0, 9 2	49 26 1 S	9 8,10 4	33053	24	EI 14	DGC
Mackay	21 08 8 S	149 11	Jul 5, 23	10 5,11 9	7 09 1 E	9 7, 9 9	49 14 2 S	10 8,11 6	33008	24	EI 24	DGC
			Jul 6, 23	14 6,15 8	7 10 8 E	14 1,14 3	49 14 1 S	14 9,15 5	33008	24	EI 24	DGC
			Jul 7, 23	8 9,10 2	7 07 8 E	10 7,10 8	49 14 6 S	9 2, 9 9	33012	24	EI 24	DGC
Rockhampton	23 21 8 S	150 30	Oct 16, 22	14 4,15 9	8 01 2 E	16 4,16 5	51 34 2 S	14 8,15 6	32212	24	EI 24	DGC
			Oct 17, 22	10 3,11 8	8 00 0 E	15 6,15 8	51 32 1 S	10 7,11 5	32226	24	EI 24	DGC
			Oct 17, 22	16 1,16 2	8 00 8 E					24		DGC
			Oct 18, 22	10 5,14 8	8 00 2 E	9 7,10 2	51 33 5 S	10 9,14 5	32226	24	EI 24	DGC
Emerald	23 30 5 S	148 10	Oct 12, 22	14 8,16 1	7 12 0 E	12 1,12 2	52 35 2 S	15 1,15 8	31680	24	EI 24	DGC
Jericho	23 35 7 S	146 08	Oct 10, 22	14 7,16 0	6 39 9 E	16 4,16 6	53 01 8 S	15 0,15 8	31638	24	EI 24	DGC
Tambo	24 53 1 S	146 16	Oct 8, 22	13 5,14 9	6 55 2 E	12 2,12 4	54 21 2 S	13 8,14 6	31070	24	EI 24	DGC
Carnarvon	24 53 2 S	113 39	Nov 11, 21	17 9	2 15 4 W	17 3	58 31 2 S	18 3	27929	13	177 2X[1]	FB
Charleville, *A*	26 24 4 S	146 14	Sep 8, 22	10 4 11 8	7 03 2 E	9 8,10 0	56 16 9 S	10 8,11 5	30182	24	EI 24	DGC
			Sep 9, 22	5 9 to 17 1(dv)	7 01 9 E					24		DGC
			Sep 11, 22	5 8,17 2	7 02 0 E			6 2 to 17 0 (dv)	30181	24		DGC
			Sep 11, 22	6 2 to 17 0(dv)	7 04 6 E					24		DGC
			Sep 12, 22			6 1 to 16 7 (dv)	56 16 3 S				EI 24	DGC
Charleville, *B*	26 24 5 S	146 14	Oct 6, 22	9 7,11 1	7 02 8 E	14 1,14 3	56 20 1 S	10 0,10 8	30154	24	EI 24	DGC

[1] 14X and 15X

AUSTRALASIA

AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Roma	26 34 3 S	148 48	Sep 2, '22	15 9,16 8	7 38 7 E	15 3,15 5	55 57 8 S	16 3	30274	24	EI 24	DGC
			Sep 4, 22	9 1	7 34 3 E	12 0,12 2	55 57 4 S	9 3,10 2	30264	24	EI 24	DGC
			Sep 4, 22	11 5,11 6	7 34 1 E			14 4,15 1	30274	24		DGC
			Sep 4, 22	14 0,15 4	7 38 6 E					24		DGC
			Sep 5, 22	10 9,11 2	7 34 4 E	10 3,10 5	55 58 6 S			24	EI 24	DGC
Cordillo Downs	26 42 9 S	140 38	Sep 15, 22	9 6,11 7	5 43 4 E			10 2,11 3	29609	6		ALK
			Sep 16, 22	9 4,11 2	5 40 8 E	14 4	57 19 3 S	10 0,10 8	29675	6	226 12(12)	ALK
			Sep 20, 22	10 5	5 37 3 E					6		ALK
			Sep 20, 22	10 8 to 17 4 (dv)	5 40 8 E					6		ALK
			Sep 20, 22	17 5	5 41 2 E					6		ALK
			Sep 21, 22	10 4	5 40 7 E					6		ALK
			Sep 21, 22	10 8 to 17 4 (dv)	5 42 4 E					6		ALK
			Sep 21, 22	17 6	5 42 1 E					6		ALK
			Sep 22, 22	10 3	5 38 1 E					6		ALK
			Sep 22, 22	10 8 to 17 4 (dv)	5 44 1 E					6		ALK
			Sep 22, 22	17 5	5 43 4 E					6		ALK
Brisbane	27 27 1 S	153 02	Aug 26, 22	14 2,16 1	9 03 3 E	11 7,11 9	56 29 0 S	14 7,15 7	29880	24	EI 24	DGC
			Aug 28, 22	6 9 to 17 9 (dv)	9 00 4 E					24		DGC
			Aug 29, 22	6 7,17 7	9 03 0 E							
			Aug 29, 22	7 2 to 17 5 (dv)	9 04 1 E			7 2 to 17 5 (dv)	29881	24		DGC
			Aug 30, 22			6 5 to 16 2 (dv)	56 29 7 S			24		DGC
Oodnadatta	27 33 1 S	135 28	May 12, 23	10 8,12 4	4 13 6 E	14 4,14 7	58 50 2 S				EI 24	DGC
			May 13, 23	6 7 to 17 1 (dv)	4 11 9 E			11 2,12 1	28881	24	EI 24	DGC
			May 14, 23							24		DGC
			May 15, 23	6 9 to 16 9 (dv)	4 13 9 E	6 6 to 17 1 (dv)	58 49 3 S				EI 24	DGC
Coongoola	27 39 2 S	145 54	Sep 15, 22	15 2,16 9	6 59 2 E			6 6 to 17 1 (dv)	28861	24		DGC
			Sep 20, 22	6 5 to 17 5 (dv)	6 55 2 E	11 1,11 3	57 53 0 S	15 6,16 5	29314	24	EI 24	DGC
			Sep 21, 22	6 4 to 17 8 (dv)	6 58 3 E					24		DGC
			Sep 22, 22	6 5 to 17 5 (dv)	6 57 2 E					24		DGC
Cunnamulla	28 04 3 S	145 42	Sep 30, 22	15 2,16 9	6 59 1 E					24		DGC
			Oct 2, 22	8 8,10 3	6 52 4 E			16 0,16 5	29074	24		DGC
			Oct 2, 22	13 2,16 5	6 57 2 E	11 0,11 2	58 18 4 S	9 1,10 0	29094	24	EI 24	DGC
			Oct 3, 22	6 4, 6 5	6 54 6 E			15 5,16 2	29094	24		DGC
			Oct 3, 22	14 0,15 4	6 58 0 E			14 3,15 1	29066	24		DGC
			Oct 4, 22	8 7,11 3	6 53 0 E	10 7,10 9	58 17 5 S			24		DGC
			Oct 4, 22	14 2,15 4	6 58 4 E			14 4,15 1	29071	24	EI 24	DGC
Goondiwindi, *A*	28 33 0 S	150 18	Oct 24 22	14 7,16 3	9 09 8 E					24		DGC
Goondiwindi, *B*	28 32 5 S	150 18	Oct 26, 22	14 4,15 8	9 12 2 E	12 6,12 8	58 13 7 S	15 1,15 9	29128	24	EI 24	DGC
Geraldton	28 47 0 S	114 37	Nov 10 21	12 5,12 9	3 24 8 W	10 9,11 1	58 14 2 S	14 8,15 6	29140	24	EI 24	DGC
Leonora	28 51 0 S	121 18	Nov 19, 21	11 5,13 0,15 2	0 31 9 W	11 6	62 21 4 S	12 7	25790	13	177 2X(78)	FB
Tenterfield	29 04 1 S	152 02	Aug 23, 22	14 6,16 2	8 59 2 E	17 0	61 50 5 S	13 5,14 8	26502	18	201 4X	JS
Marree	29 39 4 S	138 03	Jun 7, 22			12 5,12 6	58 19 3 S	15 1,15 8	29034	24	EI 24	DGC
			Jun 8, 22	9 9,11 9	5 06 8 E	15 8	60 50 2 S				226 12	ALK
Farina, *A*	30 04 4 S	138 17	May 9, 23	14 6,16 0	5 12 0 E			10 4,11 2	27707	6		ALK
			May 9, 23	10 8,12 7	5 48 6 E	13 9,14 1	60 51 6 S	15 0,15 7	27694	24	EI 24	DGC
			May 10, 23	7 6 to 17 0 (dv)	5 48 9 E	16 5	61 15 6 S	11 3,12 4	27444	6	226 12(12)	ALK
			May 11, 23							6		ALK
			May 12, 23			7 3 to 17 1 (dv)	61 13 6 S	7 5 to 17 5 (dv)	27465	6		ALK
Bourke	30 04 9 S	145 57	Jun 7, 23	13 9,15 2	7 30 5 E	15 6,15 8	60 30 4 S				226 1	ALK
			Jun 8, 23	9 0,10 2	7 28 6 E	10 7,10 8	60 30 8 S	14 2,14 9	27772	24	EI 24	DGC
			Jun 9, 23	10 0,11 5	7 28 6 E			9 3, 9 9	27782	24	EI 24	DGC
Lyndhurst Siding	30 17 3 S	138 21	Jun 6, 22	13 7,16 0	5 58 3 E	10 9	61 32 9 S	10 5,11 2	27782	24		DGC
Watheroo Observatory[2]	30 18 9 S	115 52 6	*1921*					14 6,15 5	27244	6	226 1	ALK
			Jan 4,11, 18,25,27	9 5,13 7[3]	4 23 2 W	8 8, 9 2[4]	63 56 3 S	10 5,14 2[5]	24869	7	EI 2	P,K,S
			Jan 8			10 2,11 1	63 55 4 S				EI 2	JS
			Jan 18			8 7, 9 1	63 57 2 S				EI 2	JS
			Feb 1, 8,	9 3,13 5[6]	4 23 2 W	8 5, 8 8	63 56 6 S	10 8,13 0	24876	7	EI 2	P&S
			Feb 15,22	9 2,12 7[6]	4 24 1 W	8 4, 8 7	63 56 8 S	9 7,10 8	24871	7	EI 2	P&S
			Mar 1, 8, 15,22, 29	9 4,10 7[7]	4 23 4 W	8 6, 9 0	63 56 3 S	9 9,10 8	24874	7	EI 2	P&S

[2] The declination and horizontal-intensity values were determined at station N_m and the inclination values at station N_w

[3] The second observation on January 11 was at 11h 2, the first observation on Jan 27 was at 11h 2

[4] On January 4 the times of observations were at 10h 2 and 11h 0

[5] The second observations on Jan 11, 18 were at 10h 8 and 11h 5, the observations on January 27 were at 14h 1 and 15h 7

[6] The second observation on Feb 15 was at 10h 4

[7] The second observations on Mar 8, 22, were at 13h 3 and 12h 8 respectively

AUSTRALASIA

AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′	*1921*	h h h	° ′	h h	° ′	h h	c g s			
Watheroo Observatory —*Continued*	30 18 9 S	115 52 6	Apr 5,12, 19,26	9 2,11 2[8]	4 21 9 W	9 1, 9 5	63 56 3 S	10 2,11 0[9]	24871	7	EI 2	P&S
			May 3,10, 24,31	9 6,13 6[10]	4 22 9 W	8 8, 9 1	63 58 0 S	9 7,10 7[11]	24839	7	EI 2	P&S
			May 17[12]	9 8,13 2	4 24 8 W	8 8, 9 2	64 06 2 S	10 3,11 5	24724	7	EI 2	JS
			May 21	.				9 6,10 8	24793	7	. .	JS
			May 22	.				14 2,15 4	24816	7	.	JS
			Jun 7,14, 21,28	9 1,10 9	4 21 9 W	8 4, 8 6	63 57 7 S	9 5,10 5	24845	7	EI 2	P&S
			Jul 5,12, 19,26	9 4,11 2[13]	4 22 5 W	8 4, 8 7	63 57 6 S	9 6,10 7[14]	24838	7	EI 2	P&S
			Aug 1, 9, 16,23, 30	8 3,10 1[15]	4 21 9 W	7 5, 8 1[15]	63 57 7 S	8 9, 9 8[15]	24847	7	EI 2	WCP
			Aug 12			9 3, 9 6	63 58 0 S	13 0, 13 7	24827	7	EI 2	WCP
			Sep 6,13, 20 27	8 9,10 8[16]	4 22 8 W	8 3, 8 6[17]	63 58 4 S	9 4,10 5[16]	24838	7	EI 2	P&S
			Oct 4,11	9 2,11 0	4 25 5 W	8 3, 8 5	63 59 5 S	9 6,10 6	24820	7	EI 2	P&S
			Oct 17	13 3,15 2	4 18 3 W			13 8,14 8	24828	7	. .	JS
			Oct 18,19	13 2,15 1	4 18 8 W	10 6,11 0	63 58 4 S	13 7,14 7	24834	7	EI 2	JS
			Oct 21			10 1,10 4	63 50 2 S				EI 2	JS
			Oct 22	13 2	4 19 2 W					7	.	JS
			Oct 23	10 6,15 0[18]	4 22 1 W			8 8 to 15 0	24851	7	.	WCP
			Oct 24			15 4,15 9	63 58 6 S				EI 2	WCP
			Oct 26					11 0	24848	7	.	WCP
			Nov 1			9 2, 9 9	63 50 2 S				EI 2	GRW
			Nov 2,15 22,30	9 6,11 3[19]	4 22 4 W	8 4, 8 8	63 59 1 S	10 4,10 8[19]	24838	7	EI 2	P&W
			Nov 8		.	9 8,10 3	63 59 5 S				EI 2	GRW
			Nov 9	9 0,11 8	4 20 8 W			9 6,11 2	24844	7	.	GRW
			Dec 6,13, 20,27	9 8,11 8	4 23 4 W	8 7, 9 0	63 59 0 S	10 1,11 3	24835	7	EI 2	W&S
			Dec 30	.				14 8,16 2	24825	7	.	GRW
			Dec 31	.				9 4,10 7	24840	7	. . .	GRW
			1922									
			Jan 3,10, 17,24, 31	9 7,11 4[20]	4 22 9 W	8 9, 9 3[21]	63 59 2 S	10 3,11 0[20]	24826	7	EI 2	W&S
			Feb 7,14, 21,28	9 3,11 6	4 25 2 W	8 5, 8 9[22]	64 00 3 S	9 7,10 9	24805	7	EI 2	W&S
			Mar 7,14, 21,28, 29	9 8,12 4[23]	4 22 3 W	9 0, 9 3[23]	64 00 4 S	10 4,11 6[23]	24808	7	EI 2	W&S
			Apr 4,11 18,25	9 0,11 5 .	4 22 3 W	8 5, 8 9[24]	64 01 0 S	9 5,10 7	24801	7	EI 2	W&S
			May 2, 9, 16,23, 30	9 4,11 6	4 21 1 W	8 6, 8 9	64 00 4 S	10 0,11 2	24805	7	EI 2	W&S
			Jun 6,13, 20,27	9 5,11 6	4 21 7 W	8 6, 9 0	64 00 0 S	9 8,11 1	24811	7	EI 2	W&S
			Jun 28	.		.		9 0,10 3	24816	7		GRW
			Jul 4,11, 18,25	9 3,11 5	4 21 2 W	7 9, 8 2	64 00 7 S	9 8,11 0	24798	7	EI 2	W&S
			Aug 1, 8, 15,22, 29	9 8,11 6[25]	4 22 2 W	9 0, 9 3	64 01 0 S	10 3,11 2[25]	24799	7	EI 2	W&S

[8] The second observation on Apr 19 was at 13^h 0
[9] The second observation on Apr 5 was at 13^h 6
[10] The second observations on May 10, 24 were at 10^h 8 and 10^h 2
[11] The observations on May 3 were at 11^h 1 and 13^h 5
[12] Magnetic storm in progress during observations this day
[13] The second observation on July 5 was at 13^h 2, with a third observation at 15^h 4
[14] The observations on July 5 were at 13^h 7 and 14^h 9
[15] The observations on Aug 1 were at 13^h 5, 14^h 9 in *D*, at 13^h 0, 13^h 2 in *I*, and at 13^h 8, 14^h 6 in *H*
[16] The observations on Sep 27 were at 13^h 3, 15^h 5 in *D* and at 13^h 8, 15^h 0 in *H*
[17] The observations on Sep 6 were at 13^h 2 and 13^h 5
[18] The first observation on Oct 23 was at 7^h 4
[19] The second observations on Nov 15, 22 were at 14^h 6 in *D* and at 13^h 9 in *H*
[20] The first observation on Jan 10 was at 7^h 9 in *D* and at 8^h 4 in *H*; the second observations on Jan 17 were at 13^h 8 in *D* and 13^h 3 in *H*,
[21] The observations on Jan 10 were at 6^h 3 and 6^h 6
[22] The observations on Feb 7 were at 6^h 3 and 6^h 7
[23] The observations on Mar 29 were at 13^h 7 and 15^h 8 in *D*, at 13^h 0, 13^h 3 in *I*, and at 14^h 3, 15^h 4 in *H*
[24] The observations on Apr 18 were at 6^h 5 and 6^h 7
[25] The second observation on Aug 1 was at 14^h,0 in *D* and at 13^h 5 in *H*

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AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
Watheroo Observatory —*Continued*	° ′	° ′	*1922*	h h h	° ′	h h	° ′	h h	c g s			
	30 18 9 S	115 52 6	Sep 5,12	8 8,10 9	4 22 7 W	7 7, 8 0	64 00 9 S	9 3,10 5	24804	7	EI 2	W&S
			Sep 22,26	13 4,15 6	4 18 1 W	16 7,17 0	64 01 8 S	14 0 15 2	24779	7	EI 2	W&S
			Oct 3,10, 17,24, 31	9 2,10 5[26]	4 21 4 W	6 4, 6 7[27]	64 01 1 S	9 7,10 4[28]	24796	7	EI 2	W&S
			Oct 4	9 4, 9 8	4 25 3 W					7		JS
			Nov 7,14, 21,29	9 1,11 2	4 23 4 W	8 1, 8 4	64 01 3 S	9 7,10 8	24805	7	EI 2	W&S
			Dec 5,12, 19,26	10 0,11 1[29]	4 21 4 W	8 9, 9 2[30]	64 00 9 S	10 1,10 7[31]	24805	7	EI 2	W&S
			1923									
			Jan 2, 9, 16,23, 30	9 5,11 6	4 22 1 W	8 6, 8 9	64 01 6 S	10 1 11 2	24800	7	EI 2	W&S
			Feb 6,13, 15,20, 27	9 4,11 3	4 21 9 W	8 7, 9 0	64 02 7 S	9 9,10 9	24783	7	EI 2	W&S
			Mar 2, 6, 13,20, 27	9 8,11 9[32]	4 20 9 W	9 1, 9 2[33]	64 03 2 S	10 2,11 5[34]	24776	7	EI 2	W,S,C
			Apr 5,11, 17,24	10 0,11 4[35]	4 20 7 W	9 1, 9 4[36]	64 02 8 S	10 6,10 9[37]	24775	7	EI 2	S&C
			May 1, 8, 15,22, 29	9 6,11 6	4 20 7 W	8 8, 9 1	64 02 3 S	10 2,11 2	24775	7	EI 2	W,S,C
			Jun 5,12, 15,19, 26	9 8,11 7	4 20 2 W	8 7, 9 1[38]	64 02 5 S	10 2,11 2	24784	7	EI 2	S&C
			Jun 16					9 3 10 3	24779	7		JC
			Jul 3			8 8, 9 5	64 03 4 S				EI 2	GRW
			Jul 4	8 4,10 7	4 19 8 W			8 9,10 2	24780	7		GRW
			Jul 10,17, 24,31	9 4,11 4	4 21 1 W	8 5, 8 9	64 02 7 S	9 9,10 9	24784	7	EI 2	W,S,C
			Aug 7,14, 21,28	9 8,11 4[39]	4 20 7 W	8 9, 9 2	64 02 6 S	10 3,11 0[39]	24784	7	EI 2	S&C
			Sep 4,11, 18,25	10 2,11 9[40]	4 20 8 W	9 1, 9 5	64 02 9 S	10 7,11 5[40]	24774	7	EI 2	W,S,C
			Oct 2, 9, 16,23, 30	9 7,11 5	4 21 6 W	9 0, 9 4	64 03 9 S	10 2,11 1	24760	7	EI 2	S&C
			Nov 6,13, 20,27	9 7,11 5[41]	4 19 7 W	8 9, 9 2[42]	64 03 5 S	10 2,11 1[43]	24774	7	EI 2	W,S,C
			Dec 4,11, 18,24	10 0,11 6[44]	4 20 1 W	9 3, 9 6	64 03 1 S	10 5,11 3[44]	24780	7	EI 2	W,S,C
			1924									
			Jan 2, 8, 15,29	9 9,11 7[45]	4 18 9 W	8 9, 9 4	64 03 7 S	10 4,11 2[45]	24776	7	EI 2	W,S,C
			Jan 21			8 6, 9 2	64 04 2 S				EI 2	OWT
			Jan 22	13 5 15 5	4 17 4 W			14 2,15 0	24778	7		JC
			Feb 5,12, 19,26	9 9,11 6[46]	4 19 5 W	8 8, 9 3	64 04 8 S	10 5,11 2[46]	24758	7	EI 2	W,T,C
			Mar 4,11, 18,25	9 7,11 7	4 20 6 W	8 9, 9 3	64 04 5 S	10 3,11 1	24768	7	EI 2	C&T

[26] The second observation on Oct 3 was at 11^h 8, the observations on Oct 10 were at 14^h 1 and 16^h 3, the first observation on Oct 31 was at 6^h 6
[27] The observations on Oct 3 were at 9^h 2 and 9^h 5 those on Oct 10 were at 16^h 9 and 17^h 2
[28] The observations on Oct 10 were at 14^h 6 and 15^h 9, the first observation on Oct 31 was at 8^h 2
[29] The second observations on Dec 12, 26 were at 13^h 8 and 15^h 0
[30] The observations on Dec 26 were at 11^h 3 and 11^h 6
[31] The second observation on Dec 12 was at 13^h 4, and the observations on Dec 26 were at 13^h 4 and 14^h 6
[32] The observations on Mar 2 were at 11^h 4 and 14^h 6, the second observation on Mar 6 was at 14^h 9
[33] The observations on Mar 2 were at 10^h 5 and 10^h 9
[34] The observations on Mar 2 and 6 were at 12^h 7 and 14^h 1
[35] The first observation on Apr 5 and the second observation on Apr 11 were at 8^h 5 and 13^h 8
[36] The observations on Apr 5 were at 6^h 9 and 7^h 2
[37] The first observation on Apr 5 and the second observation on Apr 11 were at 9^h 2 and 13^h 4
[38] The observations on June 15 were at 13^h 8 and 14^h 2
[39] The second observations on Aug 7 were at 13^h 8 in *D*, and at 13^h 4 in *H*
[40] The second observations on Sep 18 were at 13^h 9 in *D*, and at 13^h 5 in *H*
[41] The observations on Nov 6 were at 13^h 2 and 15^h 6, the second observation of Nov 13 was at 14^h 8
[42] The observations on Nov 6 were at 10^h 9 and 11^h 3
[43] The observations on Nov 6 were at 14^h 0 and 15^h 2, and those on Nov 13 at 13^h 2 and 14^h 4
[44] The second observation on Dec 18 was at 14^h 0 in *D* and at 13^h 6 in *H*
[45] The second observations on Jan 29 in *D* and *H* were at 15^h 6 and 13^h 8 respectively
[46] The second observations on Feb 5 and 26 in *D* were at 14^h 4 and 14^h 5, and in *H* at 13^h 8 and 13^h 9

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AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
oo Observatorv ntinued	° ′ 30 18 9 S	° ′ 115 52 6	*1924* Apr 1, 8, 16,22 29	h h h 9 8 12 0[47]	° ′ 4 18 6 W	h h 8 7, 9 1[47]	° ′ 64 04 5 S	h h 10 4,11 5[47]	c g s 24756	7	EI 2	W,T,C
			May 6,13, 20,27	9 8,11 7[48]	4 18 7 W	8 9, 9 3[48]	64 04 6 S	10 3,11 2[48]	24750	7	EI 2	J,C,T
			May 21			13 6,13 9	64 04 2 S				EI 2	JC
			Jun 3,10 17,19, 24	9 6,11 6	4 18 9 W	8 7, 9 0	64 04 5 S	10 1,11 2	24760	7	EI 2	J,C,T
			Jul 1, 8, 15,22 29	9 8,11 6	4 19 1 W	8 7, 9 3	64 04 8 S	10 4,11 3	24748	7	EI 2	J,C,T
			Aug 1					10 7,11 5	24755	7		JC
			Aug 5,12, 19,26	9 5,11 1[49]	4 20 3 W	8 5, 8 9	64 05 0 S	10 0,10 7[49]	24754	7	EI 2	J,C,T
			Sep 2, 9, 16,23, 30	9 6,11 5	4 20 9 W	8 6, 9 1	64 06 0 S	10 1,11 1	24741	7	EI 2	J,C,T
			Oct 7,14, 21,28	9 4,11 4	4 21 8 W	8 5 8 9	64 06 2 S	9 9 10 9	24737	7	EI 2	J,C,T
			Oct 22					9 7,10 6	24734	7		HFJ
			Nov 5,11 19,25	9 2,11 1	4 21 6 W	8 4, 8 7	64 06 4 S	9 7,10 2	24738	7	EI 2	J,C,T
			Nov 21					9 4,10 3	24752	7		HFJ
			Dec 2, 9 16,23, 30	9 1,10 8	4 19 6 W	8 4, 8 7	64 05 9 S	9 6,10 6	24747	7	EI 2	J,C,T
			Dec 24					11 1,11 9	24742	7		JC
			1925 Jan 6 13 20,27	9 0,10 8[50]	4 19 3 W	8 2, 8 5[50]	64 06 4 S	9 5,10 4[50]	21735	7	EI 2	J,C,T
			Feb 3,10, 17,24	9 2,11 4[51]	4 20 5 W	8 4 8 8	64 07 0 S	9 9,10 9[51]	24737	7	EI 2	J,C,T
			Feb 20					10 4,11 2	24734	7		JC
			Mar 2,10, 17,24	9 3,11 0	4 19 9 W	8 5, 9 0[5?]	64 06 9 S	10 0,10 9[52]	24731	7	EI 2	J,C,T
			Apr 1, 7, 14,21, 28	9 0,10 5[53]	4 20 8 W	8 3 8 6[54]	64 06 7 S	9 4,10 1[53]	24729	7	EI 2	J,C,T
			May 5,12, 19,26	9 1,11 3[55]	4 19 2 W	8 4, 8 7	64 07 4 S	9 6,10 3[56]	24721	7	EI 2	J,C,T
			Jun 2, 9, 16,22, 30	9 2,10 9[57]	4 18 2 W	8 4, 8 7[57]	64 07 3 S	9 8,10 6[57]	24723	7	EI 2	J,C,T
			Jul 7,14, 21,28	9 1 10 9	4 19 0 W	8 4, 8 7	64 07 2 S	9 6,10 5	21721	7	EI 2	J,C,T
			Aug 4,11, 18,25	9 1,10 7	4 19 0 W	8 3, 8 6	64 07 5 S	9 5,10 3	24727	7	EI 2	J,C,T
			Sep 1, 8, 15 29	9 2,11 0	4 19 8 W	8 3, 8 5	64 08 7 S	9 6,10 6	24712	7	EI 2	J,C,T
			Sep 24	9 0, 9 2	4 21 5 W	8 4, 8 6	64 08 0 S			7	EI 2	J&T
			Sep 25	9 3,11 2	4 18 6 W			9 8,10 8	24674	7		OWT
			Oct 6,15, 20,27	9 2,10 9	4 22 1 W	8 4, 8 7	64 09 2 S	9 6,10 5	24704	7	EI 2	J,C,T
			Nov 3,10, 17,24	9 0,10 7	4 22 0 W	8 3, 8 5	64 09 2 S	9 5,10 3	24703	7	EI 2	J,C,T
			Dec 1, 8, 15,22, 29	9 2,10 9	4 20 9 W	8 3, 8 6	64 09 6 S	9 6,10 5	24712	7	EI 2	J,C,T
			1926 Jan 5,12, 19 26	9 2,11 0	4 20 0 W	8 3, 8 6	64 09 4 S	9 8,10 6	24716	7	EI 2	J,C,T
			Feb 2, 9, 16,23	9 2,10 8	4 21 8 W	8 3, 8 5	64 10 6 S	9 6,10 4	24677	7	EI 2	J,C,T

The second observations on Apr 16 in *D* were at 14h 7 and in *H* at 14h 1 the observations in *I* on Apr 22 were at 14h 0 and 14h 4
The observations on May 20 in *D* were at 13h 4 and 15h 2, and in *H* at 13h 9 and 14h 7, those in *I* were at 10h 9 and 11h 2
The second observations on Aug 19 in *D* and *H* were at 14h 0 and 13h 5 respectively
The observations in *D* on Jan 20 were at 14h 4 and 16h 4, those in *H* at 14h 9 and 16h 0, and those in *I* at 13h 5 and 13h 9
The second observation in *D* on Feb 17 was at 10h 4, the observations in *H* on Feb 17 were at 9h 3 and 10h 1
The second observation in *I* on Mar 17 was at 8h 5, the observations in *H* on Mar 17 were at 9h 2 and 9h 9
The second observations in *D* and *H* on Apr 21 were at 11h 2 and 10h 8 respectively
The observations on Apr 1 were at 11h 4 and 11h 6
The second observations on May 12 and 19 were at 10h 4 and 10h 5 respectively
The second observation on May 26 was at 11h 0
The observations in *H* on Jun 9 were at 9h 2 and 9h 9 Those on Jun 22 were, in *D*, at 14h 2 and 16h 0, in *I*, at 13h 4 and 13h 7, and in *H*, at 15h 7 and 16h 6

AUSTRALASIA

AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′	*1926*	h h h	° ′	h h	° ′	h h	c g s			
Watheroo Observatory—*Concluded*	30 18 9 S	115 52 6	Mar 1			13 4 to 17 0 (12)	64 09 7 S				EI 2	J,C,T
			Mar 2	8 0	4 21 2 W					7		HFJ
			Mar 3	7 9 to 17 1(8)	4 18 2 W			8 4 to 16 7(8)	24682	7		J&T
			Mar 9,16, 23,30	9 0,10 7	4 21 7 W	8 2, 8 5	64 11 1 S	9 4,10 3	24675	7	EI 2	J&T
			Apr 6,13, 20,27	9 1,10 8	4 19 9 W	8 2, 8 5	64 10 4 S	9 6,10 4	24684	7	EI 2	J,C,T
			May 4,11, 18,25	8 9,10 6	4 18 5 W	8 2, 8 4	64 10 3 S	9 5,10 3	24689	7	EI 2	J&C
			Jun 1, 8, 15,22, 29	9 0,11 1	4 18 1 W	8 3	64 09 3 S	9 5,10 6	24702	7	EI 2	J,C,W
			Jul 6,13, 20,27	8 8,10 7	4 18 0 W	8 3,11 3[58]	64 09 6 S	9 4,10 3	24700	7	EI 2	J,C,W
			Aug 3,10, 17,24, 31	8 8,10 5[59]	4 19 0 W	8 3,10 8[59]	64 10 2 S	9 3,10 1[59]	24683	7	EI 2	J,C,W
			Sep 7,14, 21,28	8 5,10 4	4 19 4 W	8 2,10 6	64 10 9 S	9 1,10 0	24680	7	EI 2	J,C,W
			Oct 5,12, 19,26	8 9,10 8	4 21 0 W	8 4,11 1	64 11 2 S	9 5,10 4	24678	7	EI 2	J,C,W
			Nov 2, 9, 16,23, 30	8 7,10 3	4 20 6 W	8 3,10 5	64 10 9 S	9 2, 9 9	24682	7	EI 2	J&C
			Dec 7,14, 21,28	8 6,10 3	4 20 8 W	8 2,10 7	64 09 9 S	9 1,10 0	24702	7	EI 2	J,C,W
			1923									
Watheroo Observatory, N_m	30 18 9 S	115 52 6	Apr 5	13 3,15 1	4 16 2 W			13 8,14 7	24791	7		JS
			Apr 6	8 8,10 6	4 23 2 W			9 3,10 2	24762	7		JS
			Apr 6	13 5,15 5	4 16 6 W			14 1,15 1	24790	24		DGC
			Apr 7	9 0 to 15 5(4)	4 19 8 W			9 5 to 15 1 (4)	24776	24		DGC
Watheroo Observatory, N_w	30 18 9 S	115 52 6	Apr 9			9 2 to 11 6 (6)	64 01 6 S				EI 2	JS
			Apr 9			13 6 to 16 1 (6)	64 15 1 S				EI 24	DGC
			Apr 10			6 8 to 9 5 (6)	64 03 8 S				EI 24	DGC
			Apr 10			10 2 to 14 6 (8)	64 02 1 S				EI 2	JS
			1921									
Watheroo Observatory, S_m	30 18 9 S	115 52 6	Oct 20,21	13 5,15 3	4 18 1 W			13 8,14 8	24819	7		JS
			Oct 22	8 9,10 9	4 26 4 W			9 3,10 3	24832	7		JS
			Oct 23	16 1,17 5	4 19 2 W			16 4,17 1	24834	7		WCP
			Oct 24	8 4, 9 7	4 25 6 W			8 7, 9 4	24842	7		WCP
			Oct 24	10 0,11 4,11 7	4 24 8 W			10 4,11 1	24834	7		WCP
			1923									
			Apr 5	8 5 to 15 1 (4)	4 19 8 W			9 2 to 14 7 (4)	24773	24		DGC
			Apr 6	13 5,15 5	4 17 2 W			14 1,15 1	24790	7		JS
			Apr 7	9 0 to 15 5 (4)	4 20 0 W			9 5 to 15 1 (4)	24777	7		JS
			1921									
Watheroo Observatory, S_w	30 18 9 S	115 52 6	Jan 13			9 8,10 5	63 55 8 S				EI 2	EK
			Jan 13			13 8,14 3	63 55 6 S				EI 2	JS
			Jan 14			9 5, 9 9	63 56 4 S				EI 2	JS
			Oct 20,21			9 2, 9 6	63 59 2 S				EI 2	JS
			Oct 20			10 3,11 0	63 59 4 S				EI 2	JS
			1923									
			Apr 9			9 1 to 11 6 (6)	64 13 9 S				EI 24	DGC
			Apr 9			13 6 to 16 0 (6)	64 02 7 S				EI 2	JS
			Apr 10			6 8 to 9 6 (6)	64 02 2 S				EI 2	JS

[58] The second observation on Jul 6 was at 8^h 3

[59] The second observations on Aug 10 in D, I, and H were at 14^h 3, 14^h 8, and 13^h 7 respectively

AUSTRALASIA

AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Watheroo Observatory S_w—*Concluded*	30 18,0 S	115 52 6	Apr 10, '23			10 2 to 14 6 (8)	64 02 9 S				EI 24	DGC
Ooldea	30 27 5 S	131 48	Mar 30, 23	10 4,10 8	2 55 8 E	11 1,11 2	62 41 4 S	9 9,10 3	26538	24	EI 24	DGC
Cook	30 37 S	130 25	Apr 14, 21	15 2	2 28 8 E			16 0,17 4	26290	6		D&M
			Apr 15, 21	16 1	2 29 5 E	13 3	62 46 0 S			6	226 12	D&M
Tarcoola	30 43 1 S	134 35	Apr 26, 23	10 7,14 1	3 55 0 E	13 6,14 1	62 20 4 S	11 1,11 8	26499	24	EI 24	DGC
Deakin	30 46 0 S	128 58	May 2, 21			15 7	62 53 4 S				226 12	GFD
			May 3, 21	15 0,16 5	1 17 2 E			15 4,16 2	26304	6		GFD
Mile-Post 632	30 49 4 S	128 25	Apr 24, 23	10 4,14 1	1 53 6 E	13 6,13 8	63 13 0 S	10 8,11 5	25937	24	EI 24	DGC
Coolgardie	30 57 1 S	121 10	Nov 14, 21	11 5	1 28 4 W			13 9	25209	18		JS
			Nov 15, 21	7 2 to 18 2(dv)	1 31 1 W					18		JS
			Nov 16, 21	10 8	1 31 5 W	11 9	63 50 2 S	10 3	25211	18	201 4X	JS
Southern Cross	31 13 6 S	119 20	Nov 11, 21	16 2	2 12 0 W			16 7	24679	18		JS
			Nov 12, 21	15 8	2 10 2 W	14 5	64 29 1 S	11 2	24682	18	201 4X	JS
Werris Creek	31 21 0 S	150 39	Aug 22, 22	14 6,16 0	9 05 2 E	11 4 11 8	61 11 6 S	14 9,15 7	27487	24	EI 24	DGC
Wilcannia	31 33 7 S	143 23	May 30, 23	10 4,11 9	6 54 7 E			10 8,11 6	26702	24		DGC
			May 31, 23			8 6, 8 8	62 20 5 S				EI 24	DGC
Northam	31 38 6 S	116 40	Nov 10, 21	10 7,14 5	4 35 4 W	16 6	65 10 0 S	11 2,14 1	24004	18	201 4X	JS
Eucla	31 43 3 S	128 53	Apr 17, 23	10 7,12 5	1 48 5 E	14 7,14 9	63 51 1 S	11 3,12 1	25572	24	EI 24	DGC
			Apr 18, 23			6 6 to 17 4 (dv)	63 51 0 S				EI 24	DGC
			Apr 19, 23	6 8 to 17 3(dv)	1 46 2 E					24		DGC
			Apr 20, 23	7 0 to 17 2(dv)	1 49 8 E			6 7 to 17 4 (dv)	25549	24		DGC
Yalata Head Station	31 56 3 S	132 23	Mar 28, 23	9 6,11 3	2 47 9 E	13 7,13 9	64 26 5 S	10 0,10 9	25264	24	EI 24	DGC
Broken Hill	31 57 8 S	141 27	May 20, 23	11 1,12 7	6 03 9 E	14 8,15 0	62 41 8 S	11 6,12 4	26490	24	EI 24	DGC
			May 20, 23	16 0,16 2	6 04 7 E					24		DGC
			May 21, 23	9 4	6 05 3 E			9 7,10 9	26496	24		DGC
			May 23, 23	10 1,11 5	6 02 2 E	9 3, 9 5	62 40 6 S	10 4,11 2	26520	24	EI 24	DGC
Cottesloe, *A*	31 59 1 S	115 45	Oct 30, 21	9 9,12 2	4 48 8 W	14 6	65 27 4 S	10 4,11 3	23843	18	201 4X	B&S
Ceduna	32 08 2 S	133 36	Mar 23, 23	14 3,15 9	3 52 4 E	13 7,13 9	64 11 2 S	14 9,15 6	25506	24	EI 24	DGC
			Mar 24, 23			5 9 to 16 8 (dv)	64 12 1 S				EI 24	DGC
			Mar 25, 23	6 9 to 17 7(dv)	3 51 0 E					24		DGC
			Mar 26, 23	6 4 to 16 3(dv)	3 50 5 E			6 0 to 16 6 (dv)	25446	24		DGC
Dubbo, *A**	32 14 3 S	148 35	Jun 15, 23	14 9,16 2	7 02 1 E	13 9,14 1	61 58 4 S	15 2,15 8	27595	24	EI 24	DGC
Dubbo, *B**	32 14 9 S	148 37	Jun 14, 23	13 9,15 4	8 48 6 E	10 8,11 0	62 31 0 S	14 3,15 1	26648	24	EI 24	DGC
Narromine	32 15 S	148 12	Jun 12, 23	10 5,14 8	8 45 0 E	9 8,10 0	62 14 1 S	10 8,11 5	26751	24	EI 24	DGC
Menindie	32 23 9 S	142 26	May 26, 23	9 9,12 0	6 45 6 E	8 8, 9 0	63 19 8 S	10 2,11 0	26100	24	EI 24	DGC
Port Augusta, *A*	32 29 7 S	137 46	May 1, 23	14 8	4 53 3 E	10 6,11 0	64 20 2 S	15 4	25401	24	EI 24	DGC
			May 1, 23			11 3,11 9	64 20 4 S				EI 24	DGC
			May 2, 23	9 3	4 47 7 E	14 9,15 1	64 20 2 S	9 8	25413	24	EI 24	DGC
			May 2, 23			15 9,16 2	64 19 8 S				EI 24	DGC
			May 2, 23	10 9,12 8	4 50 6 E			11 4,12 3	25394	6		ALK
			May 3, 23	14 9,16 9	4 52 4 E	10 2,10 5	64 19 6 S	15 4,16 5	25398	24	EI 24	DGC
			May 3, 23			10 7 10 9	64 19 4 S				EI 24	DGC
			May 3, 23			11 4,11 7	64 19 7 S				EI 24	DGC
			May 3, 23			12 0,12 2	64 19 8 S				EI 24	DGC
			May 4, 23			10 6	64 19 9 S				226 12(12)	ALK
			May 4, 23			16 1	64 22 0 S				226 12(12)	ALK
			May 5, 23			9 9	64 20 4 S				226 12(12)	ALK
			May 5, 23			11 7	64 21 5 S				226 12(12)	ALK
			May 5, 23	15 5,15 7	4 53 0 E					24		DGC
Port Augusta, *B*	32 29 7 S	137 46	May 1, 23	14 8	4 55 2 E	11 2	64 20 8 S	15 4	25435	6	226 12(12)	ALK
			May 2, 23	9 3	4 48 2 E	15 6	64 20 9 S	9 8	25385	6	226 12(12)	ALK
			May 2, 23	10 9,12 8	4 51 1 E			11 4,12 3	25393	24		DGC
			May 3, 23	14 9,16 9	4 51 4 E	10 6	64 21 2 S	15 4,16 5	25403	6	226 12(12)	ALK
			May 3, 23			11 8	64 20 3 S				226 12(12)	ALK
			May 4, 23			15 8,16 0	64 21 0 S				EI 24	DGC
			May 4, 23			16 2,16 4	64 21 2 S				EI 24	DGC
			May 5, 23			9 6, 9 8	64 22 0 S				EI 24	DGC
			May 5, 23			10 1,10 3	64 22 0 S				EI 24	DGC
			May 5, 23			11 3,11 6	64 21 9 S				EI 24	DGC
			May 5, 23			11 8,12 0	64 22 2 S				EI 24	DGC
			May 5, 23	15 5,15 7	4 51 7 E					6		ALK
Wellington	32 33 6 S	148 56	Jun 16, 23	10 3,11 6	8 36 4 E	13 6,13 8	62 32 5 S	10 6,11 4	26504	24	EI 24	DGC
East Maitland	32 45 5 S	151 35	Oct 23, 21	12 8,15 5	9 33 4 E	16 0,16 2	62 21 3 S	14 0,15 1	26726	24	EI 24	DGC
Narrogin	32 55 8 S	117 10	Nov 7, 21	13 9,16 9	5 29 1 W	10 9	66 36 1 S	14 5,16 6	23016	18	201 4X	JS
Peterborough	32 56 9 S	138 51	May 19, 23			14 3	64 16 0 S				226 12(12)	ALK
			May 19, 23			16 5	64 15 5 S				226 12(12)	ALK
			Oct 2, 23	10 1,12 2	5 34 1 E	14 5	64 15 1 S	10 7,11 8	25368	6	226 12(12)	ALK
			Oct 3, 23	13 0,14 6	5 38 3 E	10 0	64 14 8 S	13 4,14 3	25390	6	226 12(12)	ALK
			Oct 3, 23	15 3,16 8	5 36 3 E	11 8	64 14 3 S	15 7,16 4	25400	6	226 12	ALK

* Local disturbance

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AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Bunbury, *A*	33 20 1 S	115 37	Oct 31, '21	14 9,16 2	5 39 2 W	17 5	66 32 8 S	15 2,15 9	23060	18	201 1X	B&S
			Nov 1, 21	6 0 to 7 0 (dv)	5 47 1 W					18		B&S
			Nov 1, 21	8 0 to 18 1 (dv)	5 44 0 W					18		B&S
			Nov 3, 21	10 6,12 9,13 8	5 43 4 W					18		B&S
Bunbury, *B*	33 20 6 S	115 38	Nov 2, 21	10 5,13 4,13 7	5 31 7 W	14 8	66 43 2 S	10 9 12 9	22936	18	201 4X	B&S
			Nov 3, 21	16 1,16 8	5 29 8 W			16 4	22952	18		B&S
Burra	33 41 0 S	138 56	Oct 30, 23			14 9	64 42 7 S				226 12	K&M
			Oct 31, 23	11 0,11 2,13 6	5 53 0 E	9 5,12 0	64 42 8 S	14 2,15 1	25152	6	226 12	K&M
			Oct 31, 23	15 5,15 7,17 3	5 53 5 E			16 1,17 0	25150	6		K&M
			Nov 1, 23	10 5,13 0	5 51 9 E			11 2,12 6	25107	6		K&M
Katanning	33 41 3 S	117 34	Nov 5, 21	12 5,14 4	4 31 3 W	11 0	66 59 6 S	13 1,14 1	22896	18	201 1X	B&S
Red Hill *A*	33 44 5 S	151 04	Oct 20, 21	9 5	9 11 4 L	13 4 13 7	63 28 6 S	10 4,11 4	25077	24	EI 24	DGC
			Oct 21, 21	9 2, 9 4	9 09 8 E					24	EI 24	DGC
Red Hill, *B*	33 44 5 S	151 04	Oct 21, 21	13 3 15 2	9 19 8 E	12 7,12 9	63 26 6 S	13 8,14 8	25958	24	EI 24	DGC
			Nov 6, 22	10 6 12 6	9 15 0 E	13 8,14 0	63 28 8 S	11 0,12 1	25960	24	EI 24	DGC
			Jun 25, 23	11 2,13 2	9 17 1 E	13 7,13 8	63 32 3 S	11 6,12 9	25912	24	EI 24	DGC
Harden	34 33 6 S	148 22	Jan 26, 22	11 8,12 2	8 49 6 E	14 0,14 2	64 31 4 S	10 6,11 4	25253	24	EI 24	DGC
Port Lincoln	34 42 6 S	135 52	Mar 19, 23	10 9,12 4	3 15 6 E	14 9,15 1	66 23 2 S	11 3,12 0	24082	24	EI 24	DGC
			Mar 20, 23	9 5,10 4	3 09 2 E	8 9, 9 1	66 25 3 S	13 9,14 7	24100	24	EI 24	DGC
			Mar 20, 23	13 5,15 1	3 15 9 E					24		DGC
Goulbourn	34 45 8 S	149 43	Jan 25, 22	11 4,13 3	9 10 6 E	14 0,14 2	64 33 8 S	12 0,12 9	25176	24	EI 24	DGC
Adelaide, *Botanical Park*	34 54 8 S	138 36	Mar 8, 23	10 3,11 8	5 27 2 E			10 6,11 5	23998	24		DGC
			Mar 9, 23	10 2,12 3	5 26 5 E	13 9,14 2	66 14 0 S	10 7,11 9	23980	6	226 12	ALK
Mount Lofty *A*	34 58 5 S	138 42	Feb 26, 23			12 9,13 3	66 15 9 S				EI 24	DGC
			Feb 26, 23			14 2 14 6	66 13 4 S				EI 24	DGC
			Feb 26, 23			15 4,15 8	66 13 0 S				EI 24	DGC
			Feb 27, 23			11 4,14 8	66 13 8 S				226 12	ALK
			Feb 27, 23			15 7,16 6	66 13 7 S				226 12	ALK
			Feb 28, 23	14 9,15 0	5 00 8 E					24		DGC
			Feb 28 23	16 0,16 2	4 58 4 E					24		DGC
			Mar 1, 23	9 3, 9 5	4 53 2 E					24		DGC
			Mar 1, 23	10 1,10 2	4 53 3 E					24		DGC
			Mar 1, 23	10 9,11 1	4 54 5 E					24		DGC
			Mar 1, 23	13 6,13 8,14,3	5 02 1 E					6		ALK
			Mar 1, 23	14 4,14 8,15 0	5 01 9 E					6		ALK
			Mar 2, 23					11 2,13 7	24127	24		DGC
			Mar 2, 23					15 0	24158	24		DGC
			Mar 5, 23					11 6,13 5	24134	24		DGC
			Mar 5, 23					14 6,15 6	24142	24		DGC
			Mar 6, 23					10 0,11 2	24122	6		ALK
			Mar 6, 23					14 1	24134	6		ALK
			Mar 6, 23					15 3,16 3	24152	6		ALK
			Mar 7, 23					10 0	24118	6		ALK
			Mar 8, 23	10 2,11 8	4 56 0 E	13 9,14 2	66 12 0 S	10 6,11 5	24140	6	226 12	ALK
			Mar 9, 23	10 2,12 3	4 54 8 E	13 8,14 0	66 21 5 S	10 7,11 9	24145	24	EI 24	DGC
Mount Lofty, *B*	34 58 5 S	138 42	Feb 26, 23			13 1,14 4	66 13 8 S				226 12	ALK
			Feb 26, 23			15 6	66 13 2 S				226 12	ALK
			Feb 27, 23			14 7,14 9	66 14 2 S				EI 24	DGC
			Feb 27, 23			15 5,15 8	66 13 8 S				EI 24	DGC
			Feb 27, 23			16 4,16 7	66 14 5 S				EI 24	DGC
			Feb 28 23	16 0,16 2	4 57 9 E					6		ALK
			Mar 1, 23	9 3, 9 5,10 1	4 55 2 E					6		ALK
			Mar 1, 23	10 2,10 9,11 1	4 55 3 E					6		ALK
			Mar 1, 23	13 6,13 8	5 02 4 E					24		DGC
			Mar 1, 23	14 3,14 4	5 03 8 E					24		DGC
			Mar 1, 23	14 8,15 0	5 03 2 E					24		DGC
			Mar 2, 23					11 2	24109	6		ALK
			Mar 2, 23					13 7,15 0	24140	6		ALK
			Mar 5, 23					11 6,13 5	24122	6		ALK
			Mar 5, 23					14 6,15 6	24130	6		ALK
			Mar 6, 23					10 0,11 2	24093	24		DGC
			Mar 6, 23					14 1,15 3	24138	24		DGC
			Mar 6, 23					16 3	24136	24		DGC
			Mar 7, 23					10 0	24129	24		DGC
Yorketown	35 01 2 S	137 36	Jun 20, 24	11 2,14 8	4 42 0 E			11 8,14 3	23662	6		ALK
			Jun 21, 24			10 4	66 40 8 S				226 12(1)	ALK
Edithburgh	35 05 9 S	137 46	Jun 23, 24	10 3,15 2	5 00 3 E	16 4	66 45 0 S	11 0,14 7	23582	6	226 12	K&M
			Jun 24, 24	10 3,10 9,13 9	5 00 5 E					6		K&M
Wagga Wagga	35 06 2 S	147 23	Jan 27 22	13 6,15 4	8 31 2 E	11 2,11 4	65 11 9 S	14 2,15 0	24845	24	EI 24	DGC
Port Victor	35 33 7 S	138 35	Nov 29, 24	10 0,12 4	5 37 0 E	14 3	66 55 4 S	10 6,11 8	23414	6	226 12	K&W
			Nov 30, 24	10 8	5 35 9 E					6		K&W
			Dec 1, 24	10 3,10 8	5 35 2 E					6		K&W

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AUSTRALIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Albury	36 05 1 S	146 55	Jan 28, '22	13 6,15 3	8 16 8 E	11 1,11 3	66 10 2 S	14 1,14 9	24203	24	EI 24	DGC
Border Town	36 18 5 S	140 46	Feb 16, 23	16 8	6 14 9 E					24		DGC
			Feb 17, 23	9 6,11 2	6 11 4 E	11 5,11 7	67 21 6 S	10 1,10 9	23333	24	EI 24	DGC
			Feb 19, 23	14 3,15 8	6 17 6 E	9 4, 9 6	67 20 0 S	14 7,15 4	23374	24	EI 24	DGC
			Feb 20, 23	9 2,10 5	6 07 8 E			9 5,10 2	23336	24		DGC
Ararat	37 17 S	142 57	Feb 15, 23	9 0,10 9	7 15 5 E	16 3,16 5	67 41 2 S	9 6,10 5	23016	24	EI 24	DGC
Toolangi, *Magnetometer Pier*	37 33 4 S	145 29	Feb 3, 22	10 7,12 6	8 08 0 E			11 2,12 1	22973	24		DGC
			Feb 3, 22	15 0,16 8	8 12 1 E			15 4,16 4	23020	24		DGC
			Feb 4, 22	10 7,12 4	8 05 5 E			11 1,12 0	22952	24		DGC
			Feb 6, 22	10 4,12 2	8 06 0 E			11 0,11 8	22996	24		DGC
			Feb 6, 22	14 8,16 6	8 13 2 E			15 4,16 2	23007	24		DGC
			Feb 7, 22	10 3,12 2	8 07 0 E			10 9,11 8	22996	24		DGC
			Feb 7, 22	14 8,16 6	8 12 2 E			15 4,16 2	23015	24		DGC
			Feb 15, 22	15 2,17 6	8 15 2 E			15 9,16 9	22967	24		DGC
			Feb 16, 22	10 8 11 1	8 03 0 E					24		DGC
			Feb 16, 22	11 4,11 8	8 04 6 E					24		DGC
			Feb 16, 22	12 1,12 4	8 07 0 E					24		DGC
			Feb 16, 22	15 4,15 7	8 15 7 E					24		DGC
			Feb 16, 22	16 0,16 3	8 17 2 E					24		DGC
			Feb 17, 22					10 0,10 8	22964	24		DGC
			Feb 17, 22					11 7,14 5	22990	24		DGC
			Feb 17, 22					15 5,16 3	23023	24		DGC
			Feb 18, 22					9 4,10 2	22982	24		DGC
			Feb 18, 22					11 1,11 9	22968	24		DGC
			Feb 20, 22	9 6, 9 9	8 02 9 E					24		DGC
			Feb 20, 22	10 3,10 5	8 04 8 E					24		DGC
			Feb 20, 22	10 9,11 2	8 06 2 E					24		DGC
Toolangi, *Inductor Pier*	37 33 4 S	145 29	Feb 3, 22			9 8,10 1	67 42 0 S				EI 24	DGC
			Feb 3, 22			14 3,14 5	67 40 2 S				EI 24	DGC
			Feb 4, 22			9 8,10 0	67 43 2 S				EI 24	DGC
			Feb 6, 22			9 8,10 0	67 41 0 S				EI 24	DGC
			Feb 6, 22			14 2,14 4	67 41 8 S				EI 24	DGC
			Feb 7, 22			9 7, 9 9	67 40 8 S				EI 24	DGC
			Feb 7, 22			14 2,14 3	67 40 6 S				EI 24	DGC
			Feb 14, 22			15 9,16 1	67 40 4 S				EI 24	DGC
			Feb 14, 22			16 5,16 7	67 40 5 S				EI 24	DGC
			Feb 15, 22			9 7,10 0	67 42 6 S				EI 24	DGC
			Feb 15, 22			10 6,11 0	67 45 2 S				EI 24	DGC
			Feb 15, 22			11 8,12 1	67 44 4 S				EI 24	DGC
			Feb 15, 22			12 6,12 8	67 43 8 S				EI 24	DGC
			Feb 20, 22			12 2,12 4	67 42 9 S				EI 24	DGC
Toolangi, *B*	37 33 4 S	145 29	Feb 9, 22			11 0,11 2	67 42 2 S				EI 24	DGC
			Feb 9, 22			11 7,11 9	67 41 8 S				EI 24	DGC
			Feb 9, 22			12 3,12 6	67 41 2 S				EI 24	DGC
			Feb 9, 22			15 0,15 2	67 38 8 S				EI 24	DGC
			Feb 9, 22			15 6,15 8	67 38 8 S				EI 24	DGC
			Feb 9, 22			16 2,16 4	67 38 6 S				EI 24	DGC
			Feb 9, 22			16 7,16 9	67 38 8 S				EI 24	DGC
			Feb 10, 22					11 6,14 2	23006	24		DGC
			Feb 10, 22					15 8,16 7	23034	24		DGC
			Feb 11, 22	9 8,11 8	8 05 6 E			10 4,11 3	22996	24		DGC
			Feb 13, 22	9 8,11 8	8 02 6 E			10 4,11 3	22978	24		DGC
			Feb 13, 22	12 2,12 4	8 09 0 E			15 2,16 1	23024	24		DGC
			Feb 13, 22	14 5,16 6	8 14 2 E					24		DGC
			Feb 13, 22	16 9,17 1	8 12 8 E					24		DGC
			Feb 14, 22	9 5,11 8	8 03 2 E			10 2,11 2	22996	24		DGC
			Feb 20, 22	15 2,15 4	8 14 6 E					24		DGC
			Feb 20, 22	15 8,16 0	8 12 7 E					24		DGC
Melbourne, *Earth-Inductor Pier*	37 49 9 S	144 58	Feb 22, 22	9 7,11 6	7 51 4 E	9 1, 9 2	67 59 2 S	10 3,11 1	22794	24	EI 24	DGC
			Feb 22, 22	14 7,16 4	8 00 6 E	13 8,14 0	67 59 5 S	15 1,15 9	22820	24	EI 24	DGC
			Feb 23, 22	9 8,11 6	7 53 2 E	9 1, 9 2	68 00 3 S	10 8,11 1	22802	24	EI 24	DGC
			Feb 23, 22	15 0,16 8	8 02 6 E	13 9,14 1	67 57 6 S	15 5,16 3	22836	24	EI 24	DGC
			Feb 23, 22			14 2,14 4	67 57 6 S				EI 24	DGC
			Feb 24, 22	9 8,11 6	7 53 6 E	9 0, 9 2	67 59 6 S	10 3,11 1	22800	24	EI 24	DGC
			Feb 24, 22	14 6,16 4	8 02 3 E	13 8 14 0	67 58 4 S	15 1,15 9	22828	24	EI 24	DGC
Latrobe	41 14 8 S	146 27	Jan 22, 23	10 5,12 7	9 26 2 E	13 2,13 4	70 40 0 S	10 9,12 1	20652	24	EI 24	DGC
Longford	41 35 9 S	147 08	Jan 23, 23	16 8	9 36 7 E					24		DGC
			Jan 24, 23	10 0,11 7	9 26 4 E	15 6,15 8	70 54 8 S	10 5,11 3	20360	24	EI 24	DGC
			Jan 25, 23	5 8, 6 6	9 28 6 E	14 0,14 2	70 54 9 S	14 9,15 6	20390	24	EI 24	DGC
			Jan 25, 23	14 5,15 9	9 38 3 E					24		DGC
			Jan 26, 23	8 5,10 0	9 25 2 E	10 4,10 6	70 55 3 S	8 9, 9 7	20398	24	EI 24	DGC

AUSTRALASIA

AUSTRALIA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Sorell	42 47 6 S	147 33	Jan 30, '23	16 1,16 3	9 57 6 E					24		DGC
			Jan 31, 23	9 6,11 3	9 52 4 E	12 9,13 1	71 52 3 S	10 0,10 9	19650	24	EI 24	DGC
			Jan 31, 23	13 5,16 0	9 55 6 E			14 0,15 6	19689	24		DGC
			Feb 1, 23	14 2,15 4	9 56 0 E	15 8,16 0	71 52 6 S	14 5,15 1	19704	24	EI 24	DGC
			Feb 2, 23	8 4,10 7	9 52 6 E	11 1,11 3	71 52 8 S	9 8,10 4	19657	24	EI 24	DGC
Hobart, *D*	42 52 2 S	147 21	Jan 29, 23	10 2,11 8	8 52 4 E	14 9,15 0	71 38 6 S	10 6,11 5	19678	24	EI 24	DGC
Southport, *A*	43 25 9 S	147 01	Feb 4, 23	15 9,17 3	10 51 9 E	17 5,17 6	72 37 0 S	16 3,17 0	18721	24	EI 24	DGC
			Feb 5, 23	6 0 to 17 6(dv)	10 49 9 E					24		DGC
			Feb 6, 23			5 7 to 17 4 (dv)	72 36 6 S				EI 24	DGC
			Feb 7, 23	6 1 to 17 2(dv)	10 49 0 E			5 8 to 17 5 (dv)	18703	24		DGC

NEW ZEALAND

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Auckland*	36 51 7 S	174 46	Mar 8, '22	10 6,15 5	15 43 8 E	16 9,17 2	62 13 4 S	11 2,15 1	26128	24	EI 24	DGC
			Aug 3, 22	15 0,17 0	15 40 5 E	14 4,14 6	62 15 4 S	15 6,16 5	26102	24	EI 24	DGC
			Aug 4, 22	6 9 to 17 8 (dv)	15 41 8 E					21		DGC
			Aug 5, 22	6 9 to 17 0 (dv)	15 43 7 E			7 4 to 16 8 (dv)	26111	24		DGC
			Aug 7, 22			6 8 to 16 8 (dv)	62 14 8 S				EI 24	DGC
Rotorua Gardens	38 09 3 S	176 16	Mar 10, 22	11 0,15 2	15 06 8 E	12 9,13 1	63 04 2 S	11 4,14 9	25474	24	EI 24	DGC
Eketahuna	40 39 S	175 43	Mar 15, 22			13 2,13 4	65 25 1 S	11 4,12 3	24149	24	EI 24	DGC
Mount Victoria*	41 18 7 S	174 47	Apr 5, 22	16 0	16 53 7 E	15 2,15 5	66 09 9 S			24	EI 24	DGC
Christchurch, *Jarrah Peg*	43 31 8 S	172 37	Mar 19, 22	7 1, 9 2	17 06 6 E	9 8,10 0	68 15 8 S	7 9, 8 8	22243	24	EI 24	DGC
Queenstown	45 02 4 S	168 42	Mar 27, 22	9 6,11 5	17 29 6 E	13 9,14 1	70 01 6 S	10 1,11 0	20920	24	EI 24	DGC
Cromwell	45 02 6 S	169 14	Mar 30, 22	10 2,11 8	17 23 9 E	14 4,14 9	70 03 4 S	10 6,11 4	20830	24	EI 24	DGC
Kingston	45 19 6 S	168 45	Mar 25, 22	9 4,11 2	17 33 8 E	12 5,12 8	70 10 2 S	9 9,10 8	20798	24	EI 24	DGC
Roxburgh	45 33 9 S	169 19	Mar 31, 22	15 3, 16 8	17 41 9 E			15 8,16 5	20729	24		DGC
			Apr 1, 22			7 9, 8 2	70 19 8 S				EI 24	DGC
Clinton	46 12 6 S	169 26	Mar 22, 22	10 4,12 4	18 40 8 E	14 3,14 5	70 48 4 S	10 9,12 0	20328	24	EI 24	DGC

EUROPE

BELGIUM

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Uccle, *Park Station*	50 47 9 N	4 21	Aug 21, '22	18 8,19 0,19 4	11 25 2 W					27		WCP
			Aug 22, 22	17 4,17 6,17 7	11 28 7 W					27		WCP
			Aug 22, 22	17 9,18 0,18 2	11 27 7 W					27		WCP
			Aug 22, 22	18 4,18 6,18 7	11 27 5 W					27		WCP
			Aug 22, 22	18 9,19 0,19 2	11 27 6 W					27		WCP
Uccle, *Pier G*	50 47 9 N	4 21	Aug 24, 22			8 0, 8 5	66 05 0 N				EI 27	WCP
			Aug 24, 22			9 0, 9 6	66 05 0 N				EI 27	WCP
			Aug 24, 22			10 2,10 6	66 04 8 N				EI 27	WCP
Uccle, *Pier NW*	50 47 9 N	4 21	Aug 22, 22					11 6,12 2	18856	27		WCP
			Aug 22, 22					12 5,13 0	18863	27		WCP
			Aug 22, 22					15 4,16 0	18872	27		WCP
			Aug 22, 22					16 3,16 9	18876	27		WCP
			Aug 23, 22					11 8,12 4	18866	27		WCP
			Aug 23, 22					12 6,13 1	18874	27		WCP
Uccle, *Pier W*	50 47 9 N	4 21	Aug 23, 22			13 9,15 1	66 02 9 N				EI 27	WCP

DENMARK

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Rude Skov, *Pier DH*	55 50 6 N	12 27	Jul 5, '22	16 2,16 3,16 5	7 40 8 W					27		WCP
			Jul 5, 22	16 6,16 8,17 0	7 40 1 W					27		WCP
			Jul 5, 22	17 1,17 3	7 39 1 W					27		WCP
			Jul 5, 22	17 5,17 7	7 38 4 W					27		WCP
			Jul 6, 22	8 8, 9 0	7 33 2 W			9 5,10 1	17075	27		WCP

* Local disturbance

EUROPE

DEMARK—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° '	° '		h h h	° '	h h	° '	h h	c g s			
Rude Skov, *Pier DH* —*Concluded*	55 50 6 N	12 27	Jul 6, '22					10 6,11 1	17078	27		WCP
			Jul 6, 22					11 7,12 2	17072	27		WCP
			Jul 20, 22	17 2,17 5	7 32 8 W			14 1,14 7	17080	27		WCP
			Jul 20, 22					15 2,15 7	17091	27		WCP
			Jul 20, 22					16 2,16 7	17096	27		WCP
Rude Skov, *Pier I*	55 50 6 N	12 27	Jul 6, 22			13 9,14 0	69 03 2 N				EI 27	WCP
			Jul 6, 22			14 2,14 4	69 03 0 N				EI 27	WCP
			Jul 6, 22			14 5,14 7	69 02 9 N				EI 27	WCP
			Jul 6, 22			14 8,15 0	69 02 6 N				EI 27	WCP
			Jul 6, 22			15 2,15 3	69 02 4 N				EI 27	WCP
			Jul 6, 22			15 5,15 6	69 02 7 N				EI 27	WCP
Rude Skov, *Stone Pillar*	55 50 6 N	12 27	Jul 20, 22	18 0,18 1	7 31 4 W					27		WCP

FINLAND

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° '	° '		h h h	° '	h h	° '	h h	c g s			
Sodankyla, *Pier S*	67 22 1 N	26 39	Jul 12, '22	11 3,19 4,19 6	1 21 4 E			11 8,19 0	12555	27		WCP
			Jul 13, 22	8 6,10 2,10 4	1 23 9 E			7 4, 8 2	12562	27		WCP
			Jul 13, 22	12 8,13 0,13 4	1 14 4 E			10 8,11 4	12541	27		WCP
			Jul 13, 22	13 5,15 8,19 8	1 15 0 E			11 8,12 4	12536	27		WCP
			Jul 13, 22	20 0,20 2,20 4	1 19 4 E			13 9,14 5	12559	27		WCP
			Jul 13, 22					14 8,15 4	12580	27		WCP
Sodankyla, *Pier W*	67 22 1 N	26 39	Jul 13, 22			16 6,16 7	75 39 6 N				EI 27	WCP
			Jul 13, 22			16 9,17 1	75 39 0 N				EI 27	WCP
			Jul 13, 22			18 2,18 4	75 37 7 N				EI 27	WCP
			Jul 13, 22			18 5,18 7	75 37 4 N				EI 27	WCP
			Jul 13, 22			19 0,19 2	75 37 5 N				EI 27	WCP
			Jul 13, 22			19 4,19 6	75 38 4 N				EI 27	WCP

FRANCE

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° '	° '		h h h	° '	h h	° '	h h	c g s			
Val Joyeux	48 49 N	2 01	May 25, '22	8 2, 8 9, 9 0	12 30 2 W			7 9, 8 6	19646	27		WCP
			May 25, 22	10 4,10 6,11 8	12 35 6 W			9 4,10 1	19652	27		WCP
			May 25, 22	13 6,14 9,15 2	12 36 1 W			10 9,11 5	19646	27		WCP
			May 25, 22					13 9,14 6	19646	27		WCP
			May 26, 22	8 3, 8 7, 9 8	12 30 3 W	13 0,13 2	64 42 6 N	7 4, 8 1	19658	27	EI 27	WCP
			May 26, 22	10 2,10 4	12 33 8 W	13 6,13 8	64 42 0 N	8 9, 9 5	19624	27	EI 27	WCP
			May 26, 22	10 5,10 7	12 33 7 W	14 0,14 2	64 42 2 N			27	EI 27	WCP
			May 26, 22			14 3,14 4	64 42 0 N				EI 27	WCP
			May 26, 22			14 6,14 7	64 42 1 N				EI 27	WCP
			May 26, 22			14 9,15 0	64 42 6 N				EI 27	WCP

GERMANY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° '	° '		h h h	° '	h h	° '	h h	c g s			
Potsdam, *TP*	52 23 N	13 04	Jun 1, '22	10 6,11 2,11 4	6 35 9 W			14 1,15 1	18604	27		WCP
			Jun 1, 22	11 7,16 4,16 7	6 39 4 W			15 4,16 0	18613	27		WCP
			Jun 2, 22	14 5,16 6	6 43 6 W			14 8,15 4	18594	27		WCP
			Jun 2, 22					15 8,16 3	18601	27		WCP
			Jun 2, 22					16 9,17 6	18621	27		WCP
			Jun 2, 22					17 9,18 5	18606	27		WCP
			Jun 3, 22	17 2,17 4	6 34 3 W	14 9,15 1	66 39 8 N			27	EI 27	WCP
			Jun 3, 22	17 6,17 8	6 36 8 W	15 2,15 4	66 39 4 N			27	EI 27	WCP
			Jun 3, 22	17 9,18 1	6 37 2 W	15 7,15 8	66 39 1 N			27	EI 27	WCP
			Jun 3, 22	18 3,18 4	6 37 6 W	16 0,16 2	66 37 6 N			27	EI 27	WCP
			Jun 3, 22			16 4,16 6	66 37 6 N				EI 27	WCP
			Jun 3, 22			16 8,17 0	66 37 6 N				EI 27	WCP

EUROPE

GREAT BRITAIN

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Eskdalemuir, *Pier 2*	55 18 9 N	356 48	Aug 13, '22					9 6,10 2	16608	27		WCP
			Aug 13, 22					10 7,11 3	16618	27		WCP
			Aug 13, 22					11 8,12 3	16655	27		WCP
			Aug 14, 22	10 1,10 4,10 6	16 23 0 W					27		WCP
			Aug 14, 22	10 8 11 1,11 4	16 23 5 W					27		WCP
			Aug 16 22	14 2,14 4	16 26 8 W			15 0,15 6	16673	27		WCP
Eskdalemuir, *Pier 3*	55 18 9 N	356 48	Aug 16, 22			10 1,10 3	69 41 2 N				EI 27	WCP
			Aug 16, 22			10 5,10 6	69 40 4 N				EI 27	WCP
			Aug 16, 22			11 0,11 1	69 40 0 N				EI 27	WCP
			Aug 16, 22			11 3,11 4	69 39 9 N				EI 27	WCP
			Aug 16, 22			11 7 11 9	69 39 9 N				EI 27	WCP
			Aug 16, 22			12 1 12 3	69 39 5 N				EI 27	WCP
			Aug 16, 22			15 8	69 40 9 N				EI 27	WCP
Eskdalemuir, *Pier 5*	55 18 9 N	356 48	Aug 14, 22	14 3 14 6,14 8	16 24 4 W					27		WCP
			Aug 14, 22	15 1,15 3 15 6	16 25 7 W					27		WCP
			Aug 14, 22	15 8,16 1	16 26 2 W					27		WCP
			Aug 15, 22					9 7,10 3	16641	27		WCP
			Aug 15, 22					10 8 11 4	16638	27		WCP
			Aug 15 22					11 9,12 4	16656	27		WCP
GreenwichObservatory, *Intensity Pier*	51 28 6 N	0 00	Aug 1 22					14 2,15 0	18430	27		WCP
			Aug 1, 22					15 3,15 8	18430	27		WCP
			Aug 2, 22					8 6 9 2	18428	27		WCP
			Aug 2, 22					9 5,10 1	18423	27		WCP
			Aug 3, 22					11 0,11 6	18428	27		WCP
			Aug 3, 22					12 8	18431	27		WCP
GreenwichObservatory, *Tent 1919*	51 28 6 N	0 00	Aug 2, 22			13 6,13 8	66 51 8 N				EI 27	WCP
			Aug 2, 22			14 0,14 2	66 51 8 N				EI 27	WCP
			Aug 2, 22			14 5,14 6	66 52 0 N				EI 27	WCP
			Aug 2, 22			14 8,15 0	66 51 0 N				EI 27	WCP
			Aug 2, 22			15 2,15 4	66 51 6 N				EI 27	WCP
			Aug 2, 22			15 5,15 7	66 52 2 N				EI 27	WCP
			Aug 3, 22	8 8, 9 0, 9 1	13 45 7 W					27		WCP
			Aug 3, 22	9 3, 9 4, 9 6	13 46 2 W					27		WCP
			Aug 3, 22	9 9,10 1,10 2	13 47 3 W					27		WCP
			Aug 3, 22	10 4,14 2,14 3	13 50 3 W					27		WCP
			Aug 3, 22	14 5,14 7	13 51 9 W					27		WCP
			Aug 3, 22	14 8,15 0	13 51 3 W					27		WCP
Kew Observatory, N_m	51 28 1 N	359 41	Sep 19, 22	10 8,11 2,11 6	14 07 2 W			9 5,10 2	18372	27		WCP
			Sep 19, 22	11 7,12 1,12 2	14 07 9 W					27		WCP
			Sep 19, 22	12 4,12 6,12 8	14 08 2 W					27		WCP
			Sep 19 22	13 0,13 2,13 3	14 08 4 W					27		WCP
			Sep 20, 22	11 0 11 2	14 06 7 W			12 3,13 0	18396	27		WCP
			Sep 21, 22					8 7, 9 9	18362	27		WCP
			Sep 21, 22					10 4,11 0	18346	27		WCP
Kew Observatory, N_w	51 28 1 N	359 41	Sep 25 22			10 6,10 8	66 58 2 N				EI 27	WCP
			Sep 25 22			11 0,11 2	66 58 6 N				EI 27	WCP
			Sep 25, 22			11 4,11 6	66 58 2 N				EI 27	WCP
			Sep 25, 22			11 8,12 0	66 57 9 N				EI 27	WCP
			Sep 25, 22			12 2,12 3	66 56 7 N				EI 27	WCP
			Sep 25, 22			12 5,12 6	66 56 8 N				EI 27	WCP
Kew Observatory, O_m	51 28 1 N	359 41	Sep 21, 22	13 3,13 6	14 11 6 W			14 9,15 5	18389	27		WCP
			Sep 22, 22	10 9,11 0,11 6	14 08 0 W			9 5,10 1	18367	27		WCP
Kew Observatory, O_w	51 28 1 N	359 41	Sep 19, 22			14 2,14 4	66 55 4 N				EI 27	WCP
			Sep 19, 22			14 6,14 8	66 56 5 N				EI 27	WCP
			Sep 19 22			15 0,15 2	66 56 8 N				EI 27	WCP
			Sep 19, 22			15 4,15 6	66 55 9 N				EI 27	WCP
			Sep 20, 22			9 0, 9 2	66 56 6 N				EI 27	WCP
			Sep 20, 22			9 4, 9 6	66 56 2 N				EI 27	WCP
			Sep 20, 22			9 8,10 0	66 56 6 N				EI 27	WCP
			Sep 20, 22			10 2,10 4	66 57 2 N				EI 27	WCP
Teddington	51 26 N	359 40	Sep 22, 22					23 6	18446	27		WCP
			Sep 23, 22					00 4,00 8	18443	27		WCP
			Sep 23, 22					01 7,02 5	18449	27		WCP

GREECE

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kephisia	38 04 3 N	23 50	Jul 11, '22	8 2, 9 9	2 48 9 W	10 5,10 7	52 41 0 N	8 6 9 4	25792	12	FI 7	PHD
			Jul 11, 22	12 8,14 1	2 53 8 W			13 2,13 8	25800	12		PHD

EUROPE

HOLLAND

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
De Bilt, *Pier 4*	52 06 N	5 11	Jun 30, '22	10 2,14 8	11 02 5 W			10 6,14 5	18332	27		WCP
			Jun 30, 22	15 0,16 4	11 07 0 W			15 4,16 0	18380	27		WCP
			Jul 1, 22	11 6,13 2	11 07 6 W			12 2,12 9	18346	27		WCP
			Jul 1, 22	15 0,15 2,15 4	11 06 1 W			14 0,14 7	18361	27		WCP
			Jul 2, 22	12 8,13 0	11 05 8 W					27		WCP
			Jul 3, 22	7 8,10 0	10 59 2 W			8 1, 8 8	18343	27		WCP
			Jul 3, 22	10 1,10 3	11 01 1 W			9 0, 9 6	18332	27		WCP
De Bilt, *Pier 8*	52 06 N	5 11	Jun 30, 22			17 0,17 3	66 53 4 N				EI 27	WCP
			Jun 30, 22			17 5,17 7	66 53 6 N				EI 27	WCP
			Jul 1, 22			8 7, 8 9	66 56 0 N				EI 27	WCP
			Jul 1, 22			9 0, 9 2	66 56 0 N				EI 27	WCP
			Jul 1, 22			9 4, 9 6	66 56 3 N				EI 27	WCP
			Jul 1, 22			9 8, 9 9	66 56 2 N				EI 27	WCP

ITALY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Terracina, *A*	41 17 0 N	13 14	May 17, '22	9 4, 9 7, 9 9	6 41 4 W	12 7,13 0	56 48 0 N	15 2,15 8	23752	27	EI 27	WCP
			May 17, 22	10 2,10 5,10 7	6 42 6 W	13 6,13 8	56 48 8 N	16 1,16 7	23756	27	EI 27	WCP
			May 18, 22			6 9, 7 2	56 49 7 N				EI 27	WCP
			May 18, 22			7 7, 8 0	56 49 8 N				EI 27	WCP
			May 18, 22			8 4, 8 7	56 49 7 N				EI 27	WCP
			May 18, 22			9 1, 9 4	56 49 8 N				EI 27	WCP
Terracina, *B*	41 17 0 N	13 14	May 16, 22	9 7, 9 9 10 2	6 40 2 W	13 3,13 6	56 46 4 N	15 7,16 3	23768	27	EI 27	WCP
			May 16, 22	10 4,10 7,11 0	6 41 9 W	14 2,14 4	56 47 6 N	16 6,17 1	23765	27	EI 27	WCP
			May 18, 22			7 7	56 50 1 N				EI 27	WCP
			May 18, 22			10 3,10 8	56 47 6 N				EI 27	WCP
			May 18, 22			11 1,11 4	56 46 8 N				EI 27	WCP
			May 18, 22			11 8,12 1	56 46 2 N				EI 27	WCP
			May 18, 22			12 4,12 6	56 45 5 N				EI 27	WCP

PORTUGAL

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Coimbra, *A*	40 12 4 N	351 35	Apr 18, '22	12 7,15 8	15 10 1 W			13 9,15 2	23092	27		WCP
			Apr 19, 20	8 8,11 6,12 0	15 03 9 W			9 6,10 9	23074	27		WCP
			Apr 19, 22	14 2,14 3,14 6	15 06 0 W			12 6,13 5	23090	27		WCP
			Apr 21, 22	13 9,14 2	15 05 5 W			11 7,13 0	23091	27		WCP
			Apr 21, 22	14 6 14 7	15 05 4 W					27		WCP
Coimbra, *B*	40 12 4 N	351 35	Apr 17, 22	9 1,11 8	15 06 6 W			10 0,11 1	23076	27		WCP
			Apr 17 22	12 2,14 6	15 11 6 W			12 7,13 8	23078	27		WCP
			Apr 18, 22	8 9,11 4,11 7	15 05 9 W			9 7 10 8	23078	27		WCP
			Apr 18, 22	11 9 12 2	15 10 2 W					27		WCP
			Apr 20, 22			9 1, 9 8	58 17 2 N				EI 27	WCP
			Apr 20, 22			10 3,10 8	58 17 8 N				EI 27	WCP
			Apr 20, 22			11 3,11 8	58 17 2 N				EI 27	WCP
			Apr 21, 22					9 3,10 4	23090	27		WCP
Coimbra, *C*	40 12 4 N	351 35	Apr 20, 22			13 2,13 7	58 16 4 N				EI 27	WCP
			Apr 20, 22			14 1,14 7	58 18 0 N				EI 27	WCP
			Apr 20, 22			15 0,15 7	58 18 5 N				EI 27	WCP

SPAIN

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Tortosa, *Pier E*	40 19 2 N	0 30	Mar 30, '22			14 4,14 8	57 38 4 N				EI 27	WCP
			Mar 30, 22			15 2,15 4	57 38 3 N				EI 27	WCP
			Mar 31, 22			13 8,14 0	57 40 3 N				EI 27	WCP
			Mar 31, 22			14 6,14 8	57 39 0 N				EI 27	WCP
			Apr 1, 22			12 7,12 9	57 37 8 N				EI 27	WCP
			Apr 1, 22			13 6,13 8	57 37 4 N				EI 27	WCP
Tortosa, *Pier M*	40 19 2 N	0 30	Mar 30, 22	11 4,13 0	11 48 8 W			11 8,12 7	23333	27		WCP
			Mar 30, 22	15 9,17 3	11 41 2 W			16 2,16 9	23298	27		WCP
			Mar 31, 22	11 6,13 0	11 45 0 W			12 0,12 7	23320	27		WCP
			Mar 31, 22	15 3,16 8	11 44 2 W			15 7,16 5	23315	27		WCP
			Apr 1, 22	10 7,12 2	11 45 8 W			11 1,11 8	23309	27		WCP
			Apr 1, 22	14 2,15 5	11 48 2 W			14 5,15 2	23328	27		WCP
			Apr 2, 22	9 4, 9 8	11 40 4 W					27		WCP

EUROPE

SPAIN—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	°		h h h	° ′	h h	° ′	h h	c g s			
San Fernando, *Pier N**	36 27 7 N	353 48	Apr 11, '22	8 1, 8 3	13 40 1 W			9 9,10 6	24960	27		WCP
			Apr 11, 22	8 7, 8 8, 9 2	13 40 1 W			14 3,15 0	24966	27		WCP
			Apr 11, 22					15 5,16 0	24954	27		WCP
			Apr 12, 22	14 7,14 9,15 2	13 48 4 W					27		WCP
			Apr 12, 22	15 4,15 6,15 7	13 48 3 W					27		WCP
			Apr 12, 22	15 9,16 0	13 48 2 W					27		WCP
			Apr 12 22	16 4,16 5	13 45 0 W					27		WCP
San Fernando, *Pier NE**	36 27 7 N	353 48	Apr 8, 22			10 2,10 5	53 53 2 N				EI 27	WCP
			Apr 8, 22			11 1,11 3	53 52 2 N				EI 27	WCP
			Apr 8, 22			14 5,14 6	53 51 2 N				EI 27	WCP
San Fernando, *S**	36 27 7 N	353 48	Apr 7, 22	8 6, 8 9,10 8	13 42 0 W	16 4,16 7	53 52 5 N	9 5,10 2	24968	27	EI 27	WCP
			Apr 7, 22	11 0,14 4,14 5	13 47 5 W					27		WCP
			Apr 8, 22	15 2,16 3	13 49 7 W	8 1, 8 3	53 55 4 N			27	EI 27	WCP
			Apr 8, 22			9 0, 9 2	53 55 0 N				EI 27	WCP
			Apr 10, 22	8 4, 8 5	13 43 5 W			9 0, 9 7	24930	27		WCP
			Apr 10, 22	14 6,14 8,15 0	13 49 1 W			10 8,11 5	24944	27		WCP
			Apr 10, 22	15 2,15 4,15 5	13 49 4 W					27		WCP

TURKEY

Station	Latitude	Long East of Gr	Date	Decl. L M T	Decl. Value	Incl. L M T	Incl. Value	Hor Int. L M T	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Rumeli Hissar	41 05 3 N	29 03	Jun 8, '22	10 5,13 0	0 33 2 W	14 2,14 5	55 46 8 N	11 2,12 7	24752	12	EI 7	PHD
			Jun 12, 22	6 3 to 18 5 (dv)	0 34 0 W			6 4 to 18 3 (dv)	24779	12		PHD
			Jun 13, 22			6 1 to 17 8 (dv)	55 47 6 N				EI 7	PHD
			Sep 16, 22	11 4,13 2	0 30 0 W	10 3,10 6	55 49 4 N	11 9,12 8	24756	12	EI 7	PHD

NORTH AMERICA

CANADA

Station	Latitude	Long East of Gr	Date	Decl. L M T	Decl. Value	Incl. L M T	Incl. Value	Hor Int. L M T	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Camp Clay, Cape Sabine	78 45 5 N	285 44	May 7, '24	16 1,20 7	98 09 1 W	18 2	85 54 0 N	18 2	*04033*	*242*	242 56(3)	RHG
Albert Harbor	72 41 5 N	282 26	Sep 5, 22	15 6	87 50 3 W	15 8	86 31 0 N			*242*	242 5	GDH
			Sep 5, 22			16 8	86 21 0 N	16 8	*03698*	*242*	242 56(1)	GDH
Albert Harbor, *Secondary*	72 41 5 N	282 26	Sep 5, 22			14 9	86 35 4 N				242 5	GDH
Ponds Inlet	72 41 3 N	281 58	Sep 6, 22	12 8	91 19 5 W	13 7	86 25 8 N	13 7	*03589*	*242*	242 56)1)	GDH
			Sep 6, 22			15 4	86 19 5 N				242 5	GDH
Ponds Inlet, *Secondary*	72 41 3 N	281 58	Sep 6, 22			15 8	86 22 5 N				242 5	GDH
Fox Channel	65 52 0 N	279 46	Aug 22, 21	11 1	(51 54 W)	13 7	(86 11 N)	13 7	(*04060*)	*242*	242 12(3)	GDH
Baffin Island No 5	65 24 4 N	283 19	Apr 4, 22	9 4	60 08 0 W	10 5	85 33 0 N	10 5	*04501*	*242*	242 56	GDH
Baffin Island No 3 (Noovookuok)	65 23 9 N	282 27	Jan 5, 22	12 4	63 09 8 W	14 9	85 35 4 N	14 8	*04707*	*242*	242 56(1)	GDH
Baffin Island No 6	65 19 9 N	284 06	Apr 8, 22	9 6	54 44 0 W	10 8	85 18 7 N	10 8	*04926*	*242*	242 56(1)	GDH
Nauwatta	65 2 N	282 4	Jan 1, 22			15 5	85 58 1 N				242 5	GDH
Baffin Island No 4	65 1 N	282 3	Jan 10, 22			15 0	85 34 3 N	14 9	*04617*	*242*	242 56(1)	GDH
Queen's Cape	64 42 0 N	281 08	Sep 3, 21	14 2,17 5	50 45 7 W	19 4	85 39 3 N	15 3,17 0	04628	16	242 1	GDH
Baffin Island No 1	64 4 N	282 5	Dec 12, 21			17 4	85 21 9 N				242 56	GDH
Bowdoin Harbor, *Absolute Observatory*	64 23 9 N	282 08	Nov 22, 21			13 9	85 31 4 N				242 12	G&H
			Nov 26, 21	11 0,14 8	52 48 4 W			11 9,13 7	04708	16		GDH
			Nov 28, 21	11 8	53 03 4 W	14 6	85 30 1 N	14 4	*04665*	*242*	242 1256(1)	GDH
			Nov 29, 21	11 2	51 33 5 W	12 9	85 28 9 N	12 9	*04759*	*242*	242 1256(1)	GDH
			Dec 2, 21	11 2	51 54 7 W	13 3	85 27 2 N	13 2	*04749*	*242*	242 56(1)	GDH
			Dec 24, 21	11 3,14 3	51 40 7 W	12 9	85 32 7 N			*242*	242 12	RHG
			Dec 29, 21	12 0,15 1	52 45 4 W	13 5	85 32 8 N			*241*	241 12	RHG
			Jan 7, 22	11 5,11 7	51 55 6 W	13 1	85 28 9 N	13 1	*04761*	*241*	241 12	RHG
			Jan 13, 22	11 4,11 6	51 58 3 W	13 1	85 28 4 N	13 0	*04763*	*241*	241 12	RHG
			Jan 20, 22	11 4,11 6	52 52 3 W	12 4	85 42 6 N			*241*	241 12	RHG
			Jan 24, 22	10 8,11 0	52 05 4 W	12 9	85 31 1 N	12 9	*04713*	*241*	241 127	RHG
			Feb 17, 22	11 1,11 3	52 48 6 W	13 2	85 34 5 N	13 2	*04628*	*241*	241 127	RHG

* Local disturbance

NORTH AMERICA

CANADA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Bowdoin Harbor, *Absolute Observatory—Concluded*	64 23 9 N	282 08	Feb 24, '22	11 4	51 52 8 W	13 1	85 28 4 N	13 1	*04736*	*241*	241 127	RHG
			Mar 4, 22	12 2	52 01 5 W					16		GDH
			Mar 7, 22	12 4	51 57 3 W					16		GDH
			Mar 16, 22	10 9	52 12 6 W	12 7	85 26 1 N	12 6	*04770*	*242*	242 56(1)	GDH
			Mar 17, 22	12 0	50 35 3 W	13 3	85 29 5 N	13 3	*04758*	*242*	242 56(3)	GDH
			Mar 18, 22			12 9	85 28 1 N	12 9	*04744*	*241*	241 127	RHG
			Mar 25, 22	11 4	52 16 0 W	12 8	85 28 7 N	12 8	*04723*	*241*	241 127	RHG
			Apr 4, 22	11 4,11 6	52 09 5 W	13 1	85 28 1 N	13 1	*04742*	*241*	241 127	RHG
			Apr 20, 22	11 5,11 7	52 16 5 W	13 1	85 30 8 N	13 1	*04690*	*241*	241 127	RHG
			Apr 25, 22	12 4,15 9	52 43 0 W			13 7,15 3	04706	16		GDH
			Apr 26, 22	11 2,14 2	51 14 6 W			12 2,12 8	04726	16		GDH
			Apr 27, 22	11 9,14 7	51 23 4 W			12 7,14 2	04695	16		GDH
			May 12, 22	11 6	52 06 4 W	12 9	85 26 1 N	12 9	*04761*	*241*	241 127	RHG
			May 18, 22	12 0	51 10 0 W			12 6	04689	16		RHG
			May 19, 22	11 9,15 8	52 17 4 W			13 0,14 8	04733	16		RHG
			May 24, 22	12 0,15 5	51 06 8 W			12 9 14 6	04728	16		RHG
			May 26, 22	11 3,11 6	51 32 6 W	13 4	85 26 6 N	13 4	*04758*	*241*	241 12567	RHG
			Jun 3, 22	14 5 14 8	53 48 1 W	16 3	85 30 7 N	16 3	*04685*	*241*	241 12567	RHG
			Jun 3, 22	17 7,17 9	53 11 9 W					*241*		RHG
			Jun 9, 22	11 2,14 4	51 51 2 W	12 9	85 26 9 N	12 9	*04759*	*241*	241 12567	RHG
			Jun 13, 22	11 7,15 1	52 30 1 W			12 6,14 2	04581	16		RHG
			Jun 14, 22	14 5,17 6	51 41 9 W	16 1	85 26 5 N	16 1	*04757*	*241*	241 12567	RHG
			Aug 2, 22	11 0,13 8	51 19 8 W	12 5	85 28 8 N	12 5	*04718*	*241*	241 12567	RHG
Bowdoin Harbor, *B*	64 23 9 N	282 08	Mar 4, 22			13 0	85 28 8 N				242 56	RHG
			Mar 7, 22			13 7	85 26 0 N	13 7	*04781*	*242*	242 56 (1)	RHG
			Mar 9, 22			12 5	85 35 0 N				241 12	RHG
			Mar 16, 22			12 7	85 27 5 N	12 7	*04751*	*241*	241 127	RHG
			Mar 17, 22			13 3	85 29 0 N	13 3	*04741*	*241*	241 127	RHG
			Mar 18, 22			12 9	85 25 1 N	12 9	*04812*	*242*	242 56(13)	GDH
Bowdoin Harbor, *C*	64 23 9 N	282 08	Apr 25, 22			14 4	85 25 8 N	14 4	*04770*	*242*	242 56(13)	RHG
			Apr 26, 22			12 7	85 17 9 N	12 6	*04930*	*241*	241 127	RHG
			Apr 27, 22			13 7	85 26 0 N	13 7	*04754*	*242*	242 56(1)	RHG
Bowdoin Harbor, *Variation Observatory Site*	64 23 9 N	282 08	Sep 9, 21	9 8,10 2	52 47 7 W					16		GDH
Baffin Island No 7	64 19 3 N	284 50	May 11, 22	15 0	55 01 1 W	16 3	84 48 0 N	16 2	*05384*	*242*	242 56(1)	GDH
Baffin Island No 2 (Shatoito)	64 18 N	282 55	Dec 15, 21			19 3	84 51 8 N	19 3	*05390*	*242*	242 56(1)	GDH
Cape Dorset, *A*	64 13 6 N	283 26	Dec 18, 21	11 1	55 17 4 W	11 7	84 44 4 N			*242*	242 56	GDH
Cape Dorset, *B*	64 13 6 N	283 26	Aug 5, 22	12 0,12 3	54 23 4 W	13 8	85 09 6 N	13 8	*05045*	*241*	241 12567	RHG
			Aug 5, 22	15 1,15 3	55 10 4 W					*241*		RHG
Amadjuak	64 01 7 N	287 05	May 18, 22	16 2	70 26 0 W	17 2	84 40 9 N	17 2	*05557*	*242*	242 56(1)	GDH
Baffin Island No 8 (Etenilk)	63 25 7 N	287 47	May 22, 22	13 3	50 27 1 W	14 4	83 59 1 N	14 3	*06252*	*242*	242 56(1)	GDH
Baffin Island No 9 (Sabooyak)	63 03 6 N	288 45	May 24 22	15 4	48 50 2 W	16 6	83 59 9 N	16 6	*06239*	*242*	242 56(1)	GDH
Baffin Island No 9, *A* (Sabooyak)	63 03 6 N	288 45	May 24, 22			14 1	(83 47 N)				242 5	GDH
Lake Harbor	62 51 3 N	290 04	Jun 4, 22			18 4	(83 28 N)				242 6	GDH
			Jun 16, 22	10 5	51 58 7 W	11 5	83 23 3 N	11 5	*06789*	*242*	242 56(1)	GDH
Lake Harbor, *Secondary 1*	62 51 3 N	290 04	Jun 4, 22			17 5	(83 21 N)				242 6	GDH
Lake Harbor, *Secondary 2*	62 51 3 N	290 04	Jun 4, 22			18 0	(83 35 N)				242 6	GDH
Ashe Inlet, *A*	62 32 8 N	289 25	Aug 17, 21	19 0,19 3	50 54 9 W	21 6	83 26 1 N			16	242 12	GDH
Baffin Island No 10	62 24 8 N	290 56	Jun 18, 22	14 9	50 49 2 W	15 6	82 56 8 N	15 6	*07188*	*242*	242 56(1)	GDH
Baffin Island No 11	62 08 8 N	292 01	Jun 21, 22	9 7	52 45 3 W	10 8	82 34 3 N	10 8	*07574*	*242*	242 56(1)	GDH
Baffin Island No 12	61 55 3 N	293 17	Jun 28, 22	17 3	51 48 4 W	18 2	82 33 1 N	18 2	*07067*	*242*	242 56(1)	GDH
			June 29, 22	13 1	50 40 9 W	14 0	82 22 7 N	13 9	*07744*	*242*	242 56(1)	GDH
Sydney	46 08 8 N	299 48	Jul 25, 21			12 7	73 59 3 N				242 12	G&H
			Jun 30, 23	12 8,16 0	26 10 7 W	14 8	73 55 5 N	14 8	*15616*	*241*	241 567	RHG
			Jul 2, 23	10 7,13 1	26 03 9 W	12 0	73 57 3 N	11 9	*15569*	*241*	241 567	RHG

CENTRAL AMERICA

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Xmakabatun	17 31 2 N	270 46	Apr 15, '23	13 1,14 5	6 55 2 E	12 4,12 6	46 09 0 N	13 5,14 2	31438	12	EI 7	WAL
Belize, *B**	17 29 4 N	271 48	Feb 12, 23	9 8,11 5	6 23 2 E	13 1 13 4	46 38 3 N	10 1 11 2	31342	26	EI 26	WAL
Belize, *A*	17 28 4 N	271 49	Feb 8, 23	10 3,12 0	5 51 8 E	14 1,14 6	46 21 3 N	10 8,11 2	31634	26	EI 26	WAL
			Feb 9, 23			7 7 to 17 6 (dv)	46 20 3 N			26	EI 26	WAL
			Feb 10, 23	7 2 to 18 0 (dv)	5 50 3 E			6 9 to 18 1 (dv)	31644	26		WAL

*Local disturbance

NORTH AMERICA

CENTRAL AMERICA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Uaxactun	17 23 8 N	270 22	Mar 22, '23	17 0,17 3	7 00 0 E			17 7	31515	12		WAL
			Mar 23, 23			8 6	45 51 0 N				EI 7	WAL
El Cayo	17 10 2 N	270 56	Feb 22, 23	15 8,17 4	6 47 1 E					12		WAL
			Apr 8, 23	15 6,17 4	6 55 0 E	13 0	45 40 4 N	16 0,16 5	31472	12	EI 7	WAL
Ucanal	16 58 8 N	270 38	Apr 5, 23	15 9,17 7	6 57 4 E			16 3,17 4	31502	12		WAL
Itsimte	16 56 0 N	269 49	Mar 8, 23	13 7	7 06 6 E			14 0	31760	12		WAL
Flores	16 56 0 N	270 06	Mar 6 23	13 0,15 3	7 00 0 E	11 0,11 5	45 10 1 N	13 8,14 9	31700	12	EI 7	WAL
			Mar 10 23	10 4,13 3	7 01 5 E			10 8,11 6	31723	12		WAL
Oak Ridge	16 23 8 N	273 38	Jun 7, 23	12 7,14 2	6 03 2 E	9 6, 9 9	45 25 0 N	13 0,14 0	31390	27	EI 27	WAL
Truxillo, *A*	15 55 8 N	274 02	May 28, 23	12 9,15 1	5 55 4 E	10 9,11 3	44 47 0 N	13 3,14 5	31458	27	EI 27	WAL
			May 28, 23			16 6,16 9	44 49 1 N				EI 27	WAL
			May 29, 23	6 8 to 17 5 (dv)	5 55 9 E			7 1, 7 9	31452	27		WAL
Truxillo, *B*	15 55 8 N	274 02	May 30, 23	10 1,11 5	5 51 3 E	12 6,13 0	44 50 0 N	10 4,11 2	31466	27	EI 27	WAL
Casuna	15 53 1 N	274 50	Jun 24, 23	9 9,11 4	5 47 3 E	13 3,13 8	45 03 8 N	10 3,11 1	31366	27	EI 27	WAL
Puerto Cortez	15 51 3 N	272 03	May 23, 23	10 2,11 5	6 51 9 E	14 1,14 8	44 15 1 N	10 5,11 2	31738	27	EI 27	WAL
Puerto Barrios	15 44 2 N	271 25	May 18, 23	13 4,15 1	6 54 4 E	16 1,16 5	43 51 4 N	13 8,14 8	31790	27	EI 27	WAL
			May 19, 23	6 7 to 17 7 (dv)	6 55 4 E					27		WAL
Zacapa	14 59 3 N	270 30	Apr 17, 26	9 6,10 6	7 21 4 E	9 0, 9 3	42 34 9 N	9 8,10 3	31937	27	EI 27	JL
Quesaltenango	14 51 4 N	268 31	Sep 25, 23	9 4,11 4	7 19 8 E	12 9,13 3	41 06 8 N	9 8,11 0	32240	27	EI 27	WAL
Copan	14 50 4 N	270 55	Apr 12, 26	10 6,14 6	7 08 4 E	9 5,10 0	42 26 0 N	10 9,14 2	31942	27	EI 27	JL
Guatemala, *A*	14 38 0 N	269 30	Sep 8, 23	10 3,11 7	7 19 8 E			10 6,11 4	32020	27		WAL
			Sep 9, 23	10 9 to 18 1 (dv)	7 19 9 E	10 0,10 2	41 48 1 N			27	EI 27	WAL
			Sep 10, 23	10 7 to 18 1 (dv)	7 20 3 E					27		WAL
			Sep 11, 23	10 7 to 18 1 (dv)	7 21 0 E					27		WAL
			Sep 12, 23	13 7,15 3	7 21 2 E	16 4,16 7	41 44 4 N	14 0,14 9	31990	27	EI 27	WAL
			Sep 13, 23			6 8 to 17 7 (dv)	41 44 7 N				EI 27	WAL
			Sep 14, 23	7 0 to 17 8 (dv)	7 22 5 E			6 8 to 18 0 (dv)	31980	27		WAL
			Apr 23, 26	9 8,11 0	7 26 8 E			10 1,10 7	31826	27		JL
			Apr 24, 26	6 1 to 17 2 (dv)	7 27 4 E			6 1 to 17 2 (dv)	31825	27		JL
			Apr 28, 26			7 3 to 18 1 (dv)	41 55 0 N				EI 27	JL
Guatemala, *B*	14 38 0 N	269 30	Sep 15, 23	9 8,11 5	7 19 0 E	13 0,13 6	41 47 7 N	10 2,11 2	32024	27	EI 27	WAL
			Apr 30, 26	10 5,11 7	7 24 4 E	10 0,10 2	41 52 8 N	10 8,11 4	31861	27	EI 27	JL
Tegucigalpa, *B*	14 06 5 N	272 47	Aug 23, 23	13 6,15 2	6 25 8 E	11 5,11 7	41 44 8 N	14 0 14 9	32120	27	EI 27	WAL
			Aug 23, 23			16 2,16 5	41 46 2 N				EI 27	WAL
			Aug 24, 23	8 4,10 0*	6 25 6 E			8 8, 9 6	32136	27		WAL
Wawa Sawmill	14 06 N	276 26	Jul 15, 23	17 3,17 5	5 37 6 E					27		WAL
			Jul 16, 23					6 4, 7 2	31534	27		WAL
Tegucigalpa, *A*	14 04 9 N	272 48	Aug 22, 23	12 6,14 4	6 44 5 E	10 8,11 4	41 49 9 N	13 0,14 1	31930	27	EI 27	WAL
San José (Guatemala)	13 55 5 N	269 13	Sep 28, 23	13 3,14 9	7 40 6 E	10 6,11 0	40 46 0 N	13 7,14 6	32448	27	EI 27	WAL
			Sep 29, 23	10 2,11 6	7 44 2 E	8 4, 8 7	40 45 8 N	10 6,11 4	32478	27	EI 27	WAL
			May 4, 26	8 9,11 2	7 49 3 E	9 2, 9 4	40 52 4 N	10 3,10 8	32310	27	EI 27	JL
San Salvador, *A**	13 41 4 N	270 49	Aug 11, 23	12 6,14 2	7 09 7 E	10 9,11 4	40 55 2 N	13 0,13 9	32425	27	EI 27	WAL
			Aug 11, 23			15 4,15 6	40 55 8 N				EI 27	WAL
			Aug 12, 23	7 1, 8 7	7 15 2 E			7 5, 8 4	32428	27		WAL
San Salvador, *B**	13 41 4 N	270 49	Aug 12, 23	10 2,11 8	6 31 6 E	13 6,13 9	41 36 2 N	10 8,11 5	30980	27	EI 27	WAL
Acajutla	13 35 2 N	270 10	May 10, 26	12 8,14 0	7 48 0 E	10 8,11 1	41 03 6 N	13 0,13 7	31962	27	EI 27	JL
Prinzapolca	13 24 7 N	276 25	Jul 13, 23	9 8,11 3	5 37 6 E	12 7	42 16 4 N	10 2,11 0	31534	27	EI 27	WAL
Amapala	13 17 7 N	272 21	Aug 17, 23	13 3,15 0	6 45 6 E	11 2,11 8	39 59 8 N	13 7,14 7	31502	27	EI 27	WAL
Corinto	12 27 2 N	272 49	Aug 6, 23	10 2,11 7	7 23 0 E	13 1,13 8	39 32 2 N	10 6,11 4	32312	27	EI 27	WAL
Managua, *A*	12 09 9 N	273 44	Aug 3, 23	9 8,11 4	6 22 0 E	12 6,13 2	39 33 1 N	10 2,11 2	32044	27	EI 27	WAL
Managua, *B*	12 09 4 N	273 44	Aug 1, 23	13 7,15 3	6 28 3 E	11 6,11 8	39 27 6 N	14 2,14 9	32100	27	EI 27	WAL
			Aug 1, 23			16 2,16 4	39 28 7 N				EI 27	WAL
			Aug 2, 23	8 1, 9 4	6 28 9 E			8 4, 9 1	32110	27		WAL
Bluefields Bluff	12 00 1 N	276 20	Jul 19, 23	9 5,11 7	5 55 6 E	12 8,13 2	40 25 1 N	9 9,11 1	31670	27	EI 27	WAL
Bluefields	11 59 5 N	276 16	Jul 9, 23	12 6,14 4	6 15 6 E	10 6,10 9	39 58 0 N	13 0,14 0	31929	27	EI 27	WAL
			Jul 9, 23			15 2,15 4	40 01 2 N				EI 27	WAL
			Jul 10, 23	6 4, 8 0	6 18 8 E			6 8, 7 6	31918	27		WAL
Granada	11 56 1 N	274 03	Jul 28, 23	10 3,11 6	6 58 8 E	13 6,13 9	39 09 6 N	10 6,11 4	32115	27	EI 27	WAL
Greytown	10 54 9 N	276 18	Jul 22, 23	9 0,10 4	6 08 6 E	10 8 10 9	38 08 2 N	9 4,10 1	32227	27	EI 27	WAL
Uvita Island	10 00 1 N	276 58	Jul 5, 23	12 6,14 2	4 43 8 E	11 6,12 1	37 17 1 N	13 0,13 9	32628	27	EI 27	WAL
Port Limon	9 58 0 N	276 55	Jul 2, 23	12 8,14 4	5 48 2 E	11 4,11 6	36 56 1 N	13 2,14 0	32196	27	EI 27	WAL
			Jul 3, 23	7 5, 9 4	5 52 1 E	10 4,10 6	36 57 6 N	8 0, 9 0	32212	27	EI 27	WAL
San José, *B* (Costa Rica)	9 56 6 N	275 56	Nov 12, 23	10 5,12 5	6 31 5 E	14 7,15 4	36 38 2 N	11 0 12 2	32220	27	EI 27	WAL
			Nov 13, 23			7 1 to 17 8 (dv)	36 31 1 N				EI 27	WAL
			Nov 14, 23	7 2 to 17 6 (dv)	6 26 9 E			6 9 to 17 7(dv)	32208	27		WAL

* Local disturbance

NORTH AMERICA

CENTRAL AMERICA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
San José, *C* (Costa Rica)	9 56 6 N	275 56	Nov 15, '23	14 3,16 6	6 07 0 E	11 2,11 5	36 43 5 N	14 7,16 1	32212	27	EI 27	WAL
San José, *D* (Costa Rica)	9 56 1 N	275 54	May 23, 26	10 5,11 7	6 18 1 E	12 4,12 8	36 27 8 N	10 8,11 4	32144	27	EI 27	JL
			May 24, 26	7 4 to 17 8 (dv)	6 15 4 E			7 4 to 17 8 (dv)	32149	27		JL
			May 25, 26			7 6 to 17 2 (dv)	36 30 9 N				EI 27	JL
San José, *E* (Costa Rica)	9 56 1 N	275 54	May 26, 26	10 6,11 6	6 12 8 E	10 1,10 3	36 37 8 N	10 8,11 3	32184	27	EI 27	JL
San José, *A* (Costa Rica)	9 55 0 N	275 57	May 22, 26	12 7	6 18 7 E					27		JL
Colon, *Washington Hotel*	9 22.0 N	280 05	Oct 30, 22	12 4,14 1	5 09 0 E	10 5,11 0	37 09 0 N	12 8,13 7	31876	26	EI 26	WAL
			Oct 31, 22	6 4 to 16 6(dv)	5 08 4 E					26		WAL
			May 30, 26	15 3,15 7	5 09 9 E	16 3,16 6	37 31 8 N	17 3,18 0	31674	27	EI 27	JL
			May 30, 26	16 8,17 0	5 10 4 E					27		JL
			May 31, 26	12 8,13 0	5 09 2 E	10 9,11 1	37 33 6 N	11 5,12 0	31707	27	EI 27	JL
Colon, *Sweetwater*	9 21 3 N	280 03	Oct 12, 21	9 9,11 3	5 17 5 E	12 8,13 0	37 04 2 N	10 3,11 0	31776	25	EI 25	CVI
			Oct 27, 22	10 7,13 8	5 19 6 E	14 6,15 0	37 11 2 N	11 2,13 0	31739	26	EI 26	WAL
Colon, *Limon Point*	9 19 1 N	280 03	Jun 2, 26	9 9,12 1	6 13 9 E	12 6,12 8	37 19 7 N	11 1,11 8	31647	27	EI 27	JL
Old Panama, *A*	9 00 2 N	280 31	Oct 17, 21	9 3,10 6	5 26 2 E	11 2,11 4	36 49 4 N	9 7,10 3	31850	25	EI 25	CVI
			Oct 10, 23	13 2,15 3	5 28 8 E	11 2,11 5	37 02 4 N	13 6,14 8	31743	27	EI 27	WAL
			Oct 11, 23			6 8 to 8 8 (7)	37 06 1 N				EI 27	WAL
			Sep 30, 24	13 7,15 2	5 30 0 E	12 4,12 6	37 07 9 N	14 2,15 8	31682	27	EI 27	JL
			Oct 1, 24	6 1 to 17 2(dv)	5 28 9 E			6 1 to 17 2 (dv)	31698	27		JL
			Oct 3, 24			6 9 to 17 5 (dv)	37 04 8 N				EI 7	JL
			Jun 7, 26	10 6,11 7	5 29 4 E	10 1,10 3	37 24 3 N	10 9,11 4	31574	27	EI 27	JL
			Jun 8, 26	5 8 to 17 4(dv)	5 33 0 E			5 8 to 17 4 (dv)	31566	27		JL
			Jun 9, 26			7 3 to 14 4 (dv)	37 22 4 N				EI 27	JL
			Jun 10, 26	7 0 to 17 1(dv)	5 36 4 E			7 0 to 17 1 (dv)	31576	27		JL
			Jun 12, 26			7 0 to 17 1 (dv)	37 20 1 N				EI 27	JL
Old Panama, *Auxiliary A*	9 00 2 N	280 31	Jun 15, 26	11 3,11 6	5 28 0 E					27		JL
Old Panama, *B*	9 00 2 N	280 31	Oct 11, 23	12 4,14 0	5 12 0 E			12 8,13 7	31826	27		WAL
			Oct 12, 23	6 5 to 17 3(dv)	5 13 9 E			6 2 to 17 4 (dv)	31843	27		WAL
			Oct 13, 23			6 7 to 17 5 (dv)	36 56 0 N				EI 27	WAL
Old Panama, *C*	9 00 2 N	280 31	Oct 2, 24	10 1,11 4	5 18 2 E	12 4,12 7	36 59 6 N	10 5,11 2	31637	27	EI 27	JL
			Jun 14, 26	9 3,10 7	5 11 8 E	8 7, 9 0	37 13 8 N	9 6,10 3	31560	27	EI 27	JL
Corozal, *A*	8 58 9 N	280 26	Jun 26, 26	15 2	4 42 7 E					27		JL
			Jun 27, 26	10 4,11 7	4 37 6 E	9 3, 9 6	37 43 6 N	10 7,11 3	31396	27	EI 27	JL
			Jun 28, 26	13 1,14 6	4 40 9 E	14 9,15 2	37 52 8 N	13 4,14 3	31400	27	EI 27	JL
Corozal, *B*	8 58 9 N	280 26	Jun 28, 26	11 3	4 42 2 E			12 1	31646	27		JL
			Jun 29, 26	9 9	4 44 0 E	8 7, 8 9	37 10 9 N	9 6	31615	27	EI 27	JL
Ancon Hill	8 57 4 N	280 27	Jun 18, 26	8 8, 9 9	5 20 1 E	8 2, 8 4	37 08 6 N	9 1, 9 6	31680	27	EI 27	JL
David, *A*	8 26 3 N	277 35	Oct 23, 23	12 9,14 4	6 05 8 E			13 3,14 1	32432	27		WAL
			Oct 24, 23	7 4, 9 4	6 04 2 E			7 8, 8 9	32428	27		WAL
			Oct 27, 23			8 1, 8 5	35 11 1 N				EI 27	WAL
			Oct 27, 23			11 5,11 6	35 10 4 N				EI 27	WAL
David, *B*	8 25 3 N	277 34	Oct 26, 23	10 1,11 4	5 57 1 E	13 4,13 7	35 10 5 N	10 4,11 2	32218	27	EI 27	WAL

GREENLAND

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Refuge Harbor, *Absolute Observatory*	78 32 5 N	287 37	Oct 22, '23	13 0	100 04 4W	14 1	85 46 7 N	14 8	*04143*	*241*	241 567	RHG
			Nov 10, 23	12 7,15 9	99 36 0W	14 1	85 45 6 N	14 9	*04155*	*241*	241 567	RHG
			Nov 16, 23	12 2,16 1	98 36 2W	13 7	85 46 7 N	14 1	*04129*	*241*	241 567	RHG
			Nov 23, 23	22 4	99 47 9W					*241*		RHG
			Nov 24, 23	2 3	99 47 1W	0 4	85 48 1 N	0 4	*04093*	*241*	241 567	RHG
			Dec 10, 23	13 0,17 7	100 08 6W	15 5	85 45 7 N	15 4	*04119*	*241*	241 567	RHG
			Dec 21, 23	1 2, 5 7	99 40 2W	3 6	85 47 4 N	3 5	*04130*	*241*	241 567	RHG
			Dec 30, 23	15 0,19 2	100 05 6W	17 2	85 46 3 N	17 2	*04148*	*241*	241 567	RHG
			Jan 10, 24	15 2,19 6	100 11 4W	17 6	85 44 8 N	17 6	*04177*	*241*	241 567	RHG

NORTH AMERICA

GREENLAND—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Refuge Harbor, *Absolute Observatory–Concluded*	78 32 5 N	287 37	Jan 22, '24	1 1, 5 6	99 41 3W	3 3	85 47 8 N	3 3	*04125*	*241*	241 567	RHG
			Jan 26, 24	14 5,18 6	99 58 5W	16 6	85 46 3 N	16 6	*04148*	*241*	241 567	RHG
			Feb 14, 24	14 0,18 3	99 47 4W	16 3	85 46 7 N	16 3	*04145*	*241*	241 567	RHG
			Feb 25, 24	14 3,19 3	99 56 6W	16 8	85 44 8 N	16 6	*04176*	*241*	241 567	RHG
			Mar 1, 24	13 1,17 0	99 53 0W	15 0	85 46 8 N	15 0	*04141*	*241*	241 567	RHG
			Mar 6, 24	12 8,16 8	100 39 5W	14 8	85 44 9 N	14 8	*04173*	*241*	241 567	RHG
			Mar 15, 24	13 2,17 2	100 01 0W	15 2	85 46 6 N	15 2	*04145*	*241*	241 567	RHG
			Mar 28, 24	13 2,17 7	99 47 3W	15 5	85 46 6 N	15 4	*04145*	*241*	241 567	RHG
			Apr 7, 24	13 4,17 0	100 57 1W	15 3	85 45 9 N	15 3	*04157*	*241*	241 567	RHG
			Apr 19, 24	13 0,16 2	100 01 2W	14 7	85 46 5 N	14 6	*04145.*	*241*	241 567	RHG
			Apr 26, 24	13 3,16 4	99 58 0W	14 9	85 45 2 N	14 8	*04166*	*241*	241 567	RHG
			May 3, 24	12 8,15 7	100 05 0W	14 3	85 45 8 N	14 3	*04155*	*241*	241 567	RHG
			May 5, 24	11 2,14 4	100 15 0W	12 9	85 47 2 N	12 9	*04134*	*242*	242 56(3)	RHG
			May 17, 24	12 3,15 2	100 02 4W	13 8	85 45 0 N	12 8	*04167*	*242*	242 56(3)	RHG
			May 27, 24	11 5,14 4	101 00 0W	13 0	85 40 9 N	13 0	*04220*	*242*	242 56(3)	RHG
			Jun 4, 24	10 9,13 8	100 06 6W	12 4	85 40 5 N	12 4	*04236*	*241*	241 567	RHG
			Jun 13, 24	10 9,13 6	100 09 0W	12 3	85 48 1 N	12 2	*04119*	*241*	241 567	RHG
			Jun 19, 24	10 4,13 4	101 14 4W	12 0	85 54 3 N	12 0	*04014*	*241*	241 567	RHG
Refuge Harbor, *Variation Observatory Site*	78 32 5 N	287 37	Aug 18, 23			11 8	85 47 1 N				241 56	RHG
Etah	78 19 5 N	287 18	Aug 10, 23	11 2,13 0,16 4	101 39 1W	14 7	86 00 7 N	14 7	*03927*	*241*	241 567	RHG
			Aug 11, 23	10 7,13 2	101 20 2W	12 0	86 02 9 N	12 0	*03918*	*241*	241 567	RHG
Keate	77 20 5 N	288 29	Aug 5, 24	9 6,16 3	90 45 6W	10 5,17 0	85 57 6 N	11 0	*03994*	*241*	241 567	RHG
Akpani (Parker Snow Point)	76 06 0 N	291 42	Aug 9, 24	11 1,12 6	82 00 6W	12 3	85 03 6 N	12 3	*04830*	*241*	241 567	RHG
Akpani, *Auxiliary*	76 06 0 N	291 42	Aug 7, 24	14 2,15 6	80 44 4W	15 1	85 00 0 N			*241*	241 56	RHG
Godhavn	69 15 0 N	306 28	Aug 17, 24	8 0,11 0	58 48 6W	9 6	81 40 9 N	9 6	*08167*	*241*	241 567	RHG
			Aug 18, 24	9 4,12 2	59 12 0W	10 9	81 38 5 N	10 9	*08195*	*241*	241 567	RHG
Holstensborg	66 55 9 N	306 22	Aug 23, 24	18 2,19 6	54 02 8W	19 0	81 38 3 N			*241*	241 56	RHG
			Aug 24, 24	11 0,13 4	53 46 1W	12 3	81 38 5 N	12 2,18 8	*08153*	*241*	241 567	RHG
			Aug 24, 24	17 9,19 5	53 48 5W	18 8	81 39 7 N			*241*	241 7	RHG
Godthaab	64 11 6 N	308 17	Jul 29, 23	10 3,13 1	50 48 2W	11 8,17 2	79 40 7 N	11 8,17 2	*10046*	*241*	241 567	RHG
			Jul 29, 23	16 0,18 5	51 00 1W					*241*		RHG
			Aug 29, 24	12 8,14 4	50 20 8W	14 1	79 33 1 N	14 2	*10105*	*241*	241 567	RHG

MEXICO

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Nueva Casas Grandes	30 25 5 N	252 05	Aug 16, 24	10 1,11 2	12 26 2 E	11 5,11 6	57 49 4 N	10 4,11 0	27624	26	EI 26	JWG
Hermosillo	29 04 4 N	249 03	Aug 8 24	12 5,15 7	13 37 7 E	11 3,11 5	55 47 8 N	13 0,13 4	28360	26	EI 26	JWG
Chihuahua, *B**	28 38 9 N	253 56	Aug 18, 24	13 4,14 8	13 03 8 E	12 7,12 8	56 21 8 N	13 7,14 5	28252	26	EI 26	JWG
Chihuahua, A*	28 37 6 N	253 55	Aug 19, 24	16 0	14 50 9 E	16 8	55 03 6 N	16 3	28839	26	EI 26	JWG
Chihuahua, *C**	28 37 6 N	253 55	Aug 19, 24	7 4 to 9 0 (8)	14 25 5 E			7 6 to 8 8 (6)	29756	26		JWG
			Aug 19, 24	10 6,11 8	14 21 4 E	10 3,10 4	53 29 0 N	10 9 11 5	29758	26	EI 26	JWG
			Aug 19, 24	12 6 to 14 2 (8)	14 20 1 E	12 3,15 4	53 29 8 N	12 8 to 14 1 (6)	29750	26	EI 26	JWG
Guaymas, *A*	27 55 4 N	249 03	Aug 5, 24	13 3,13 5,17 4	12 29 0 E	15 9,16 1	54 23 4 N	14 0,14 6	28850	26	EI 26	JWG
			Aug 5, 24					16 6,17 1	28820	26		JWG
			Aug 7, 24	6 7, 6 9, 7 1	12 34 8 E	9 0,11 3	54 22 1 N	7 7, 8 2	28848	26	EI 26	JWG
			Aug 7, 24	12 3,13 0,13 6	12 29 3 E			12 6,13 3	28844	26		JWG
Guaymas, *B*	27 54 6 N	249 08	Aug 6, 24	10 0 11 3	12 48 0 E	12 4,12 6	54 16 0 N	10 3,11 0	29016	26	EI 26	JWG
Sabinas, *A*	27 51 4 N	258 54	Jun 14, 24	10 4,11 7	10 31 0 E	14 5,15 6	56 40 6 N	10 7,11 4	28248	26	EI 26	JWG
Sabinas, *B*	27 51 4 N	258 54	Jun 14, 24	14 0, 16 0	10 31 4 E	11 4,11 6	56 37 4 N	14 6,15 5	28226	27	EI 27	JL
Monterrey, *A*	25 40 5 N	259 40	Jun 17, 24	13 4,14 8	9 53 2 E	11 2,11 4	54 03 5 N	13 7,14 5	29368	26	EI 26	JWG
			Jun 18, 24	6 4 to 17 8 (dv)	9 54 1 E			6 4 to 17 8 (dv)	29322	26		JWG
			Jun 19, 24			6 3 to 18 0 (dv)	54 08 4 N				EI 26	JWG
Monterrey, *B*	25 40 5 N	259 40	Jun 17, 24	13 8,15 8	9 54 0 E	11 2,11 5	54 03 6 N	14 3,15 3	29343	27	EI 27	JL
			Jun 18, 24	7 1 to 17 6 (dv)	9 54 9 E					27		JL
			Jun 19, 24	6 6 to 17 7 (dv)	9 54 5 E			6 6 to 17 7 (dv)	29286	27		JL
Culiacan	24 47 5 N	252 36	Aug 2, 24	12 6,13 8	10 33 0 E	11 6,11 7	51 26 2 N	12 9,13 5	30181	26	EI 26	JWG
Mazatlan, *A*	23 11 4 N	253 35	Jul 28, 24	15 9,17 2	11 03 0 E	14 4,14 6	49 44 0 N	16 3,17 0	30590	26	EI 26	JWG
			Jul 29, 24	6 0 to 17 7 (dv)	11 02 6 E			6 0 to 17 7 (dv)	30600	26		JWG
			Jul 30, 24			6 3 to 18 0 (dv)	49 44 6 N				EI 26	JWG

* Local disturbance

NORTH AMERICA

MEXICO—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Mazatlan, *B*	23 11 3 N	253 35	Jul 31, '24	11 1,12 2	10 59 0 E	12 6,12 8	49 40 6 N	11 4,12 0	30680	26	EI 26	JWG
Tampico	22 14 9 N	262 08	Jul 22, 24	10 2,11 8	9 13 4 E	8 8, 9 0	50 11 0 N	10 7,11 4	30806	27	EI 27	JL
San LuisPotosi	22 08 5 N	259 05	Jul 17, 24	16 1,18 2	9 38 9 E			16 7,17 7	30776	27		JL
			Jul 18, 24			10 6,10 9	49 22 6 N				EI 27	JL
Tepic	21 31 3 N	255 06	Jul 25, 24	15 3,16 5	10 16 6 E	14 4,14 6	47 31 2 N	15 6,16 2	31343	26	EI 26	JWG
Merida, *A*	20 58 2 N	270 24	Sep 1, 24	15 1	6 37 1 E	14 0,14 2	51 05 2 N			27	EI 27	JL
			Sep 2, 24	7 4 to 17 7 (dv)	6 38 2 E			7 4 to 17 7 (dv)	30071	27		JL
			Sep 3, 24			8 0 to 18 3 (dv)	50 59 8 N				EI 27	JL
			Sep 5, 24	7 7, 8 9	6 41 2 E			8 0, 8 6	30076	27		JL
Merida, *B*	20 58 2 N	270 24	Sep 5, 24	10 2,11 3	6 35 0 E	11 5,11 7	51 12 3 N	10 4,11 0	30027	27	EI 27	JL
Guadalajara, *B*	20 44 3 N	256 37	Jul 18, 24	13 0,14 1	10 01 0 E			13 4,13 8	31140	26		JWG
			Jul 19, 24			9 8,10 0	47 36 8 N				EI 26	JWG
Guadalajara, *A*	20 44 2 N	256 37	Jul 18, 24	7 8, 8 0, 9 2	10 03 0 E	10 6,11 0	47 40 2 N	8 3, 8 9	31219	26	EI 26	JWG
			Jul 18, 24			12 4	47 39 5 N				EI 26	JWG
			Jul 18, 24	17 2	10 00 6 E	15 8,17 4	47 42 0 N	16 3,16 9	31191	26	EI 26	JWG
			Jul 19, 24	12 6,13 4	9 57 8 E	8 9,10 2	47 40 2 N			26	EI 26	JWG
			Jul 19, 24	13 6,14 3	9 58 8 E			13 0,14 0	31213	26		JWG
Chichen Itza	20 41 N	271 26	Sep 7, 24	9 3,10 8	6 30 0 E	11 3,11 6	50 36 8 N	9 7,10 5	30132	27	EI 27	JL
Queretaro, *C**	20 35 6 N	259 36	Jul 15, 24	8 9	9 22 5 E			9 3	31514	27		JL
Queretaro, *Secondary C**	20 35 6 N	259 36	Jul 15, 24			8 9	47 28 4 N				EI 26	JWG
Queretaro, *A**	20 35 2 N	259 34	Jul 12, 24	13 0,14 1	9 08 0 E	14 5,14 7	48 23 0 N			26	EI 26	JWG
			Jul 12, 24			17 7,17 9	48 22 6 N	16 6,17 2	31038	26	EI 26	JWG
			Jul 13, 24	7 7, 8 0, 8 4	9 14 8 E	8 8,10 6	48 22 2 N			26	EI 26	JWG
			Jul 13, 24	12 6	9 07 5 E	11 5,12 3	48 22 0 N	12 9,13 5	31074	26	EI 26	JWG
Queretaro, *B**	20 35 0 N	259 36	Jul 12, 24	13 4,16 5	9 15 4 E	17 2,17 3	47 40 0 N	14,1 15 6	31503	27	EI 27	JL
Queretaro, *D**	20 34 8 N	259 35	Jul 15 24	10 4	9 38 2 E			10 8	31380	27		JL
Queretaro, *Secondary D**	20 34 8 N	259 35	Jul 15 24			10 7	48 02 2 N				EI 26	JWG
Campeche	19 50 9 N	269 28	Aug 24, 24	8 3, 9 7	7 21 6 E	10 9,11 1	49 21 1 N	8 7, 9 4	30745	27	EI 27	JL
Teoloyucan Observatory, *B*	19 44 8 N	260 49	Jun 27, 24	9 5,11 8	9 16 4 E			10 2,11 2	31576	26		JWG
			Jun 27, 24	13 9,15 7	9 17 4 E			14 4,15 3	31555	26		JWG
			Jun 28, 24	8 9,10 9	9 15 4 E			9 5,10 3	31574	26		JWG
			Jul 1, 24			13 0 to 15 5 (12)	46 29 8 N				EI 26	JWG
Teoloyucan Observatory, *Pier A*	19 44 8 N	260 49	Jun 28, 24	11 9,15 1,15 5	9 12 6 E			13 8,14 5	31554	26		JWG
			Jun 28, 24	17 3,17 7	9 13 7 E			16 0,16 8	31534	26		JWG
			Jun 30, 24	15 3	9 12 7 E			15 7,16 4	31552	26		JWG
Teoloyucan Observatory, *Pier B*	19 44 8 N	260 49	Jul 1, 24			9 7 to 12 2 (12)	46 30 7 N				EI 26	JWG
Vera Cruz	19 11 7 N	263 55	Jul 27, 24	11 3,12 5	8 32 6 E	10 4,10 8	46 36 4 N	13 1,14 0	31478	27	EI 27	JL
Puebla, *A*	19 03 N	261 47	Jun 26, 24	12 8,13 2,13 5	9 14 9 E			16 8,17 6	31300	27		JL
			Jun 27, 24	7 2, 7 4, 7 7	9 17 2 E	8 6, 8 9	46 41 1 N	12 5,13 4	31404	27	EI 27	JL
			Jun 27, 24			15 9,16 1	46 40 4 N				EI 27	JL
Puebla, *B*	19 03 N	261 47	Jun 28, 24	10 6,12 4	9 31 0 E	13 1,13 4	46 41 1 N	11 1,11 9	31456	27	EI 27	JL
Frontera	18 31 8 N	267 21	Aug 16, 24	8 5,14 1	7 31 0 E	11 3,11 6	46 46 7 N	13 1,13 8	31384	27	EI 27	JL
Puerto Mexico, *A*	18 09 7 N	265 37	Aug 1, 24	8 4, 8 8, 9 0	8 20 0 E	11 4,11 6	45 41 0 N			27	EI 27	JL
			Aug 1, 24			17 1,17 4	45 41 4 N	14 5,15 4	31680	27	EI 27	JL
			Aug 2, 24	14 1 14 4,14 7	8 14 6 E					27		JL
			Aug 4, 24					16 6,17 2	31698	27		JL
			Aug 11, 24	8 8 to 18 0 (dv)	8 16 7 E			8 8 to 18 0 (dv)	31690	27		JL
Puerto Mexico, *B*	18 09 7 N	265 37	Aug 4, 24	10 4,11 8	8 15 8 E	8 7, 9 0	45 37 8 N	10 8,11 4	31734	27	EI 27	JL
Oaxaca, *A*	17 03 6 N	263 16	Jun 30, 24	16 4	8 31 0 E			17,0 17 7	31966	27		JL
			Jul 1, 24	7 1, 7 4, 7 7	8 34 6 E	9 3, 9 6	43 32 9 N			27	EI 27	JL
			Jul 1, 24	15 2	8 29 7 E	15 8,15 9	43 37 6 N	12 8,13 5	31992	27	EI 27	JL
Oaxaca, *B*	17 03 6 N	263 16	Jul 2, 24	10 6,12 4	8 27 2 E	13 1,13 3	43 35 2 N	11 1,11 9	32017	27	EI 27	JL

NEWFOUNDLAND (INCLUDING LABRADOR COAST)

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Port Burwell, *B*	60 24 8 N	295 08	Aug 13, '22	11 5,11 8	40 27 1W	13 3	81 33 7 N	13 3	*08759*	*241*	241 12567	RHG
			Aug 13, 22	14 9,15 0	40 09 5W					*241*		RHG
			Aug 28, 22			19 2	81 34 8 N				242 56	GDH
Nain	56 32 8 N	298 19	Aug 20, 22	15 8,16 0	41 30 4W	17 4	77 13 6 N	17 5	*12778*	*241*	241 567	RHG
			Aug 20, 22	18 8,18 9	41 33 8W					*241*		RHG

* Local disturbance

NORTH AMERICA

NEWFOUNDLAND (INCLUDING LABRADOR COAST)—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Hopedale, *A*	55 27 1 N	299 48	Jul 23, '23	15 8,18 5	38 21 0W	17 2	78 25 9 N	17 2	*11558*	*241*	241 567	RHG
Hopedale, *B*	55 27 1 N	299 48	Sep 6, 24	12 9,14 8	38 32 3W	13 9	78 24 2 N			*241*	241 56	RHG
Rigolet	54 10 9 N	301 33	Sep 25, 22	16 0,16 5	36 15 7W	17 3	78 00 0 N			*242*	242 56	GDH
			Sep 26, 22	9 6,10 0	36 17 5W	11 2	78 02 3 N	11 2	*11814*	*242*	242 56(1)	GDH
			Sep 26, 22	14 2,14 5	36 18 7W					*242*		GDH
Gready	53 48 2 N	303 35	Jul 15, 23	10 0,10 3,13 3	36 14 8W	11 8	76 33 8 N	11 8	*13607*	*241*	241 567	RHG
Cartwright	53 41 5 N	303 02	Sep 29, 22			15 8	77 32 7 N	15 7	*12102*	*242*	242 56(1)	GDH
Battle Harbor, *C*	52 16 4 N	304 25	Aug 3, 21			12 2	75 53 8 N	12 2	*13588*	*242*	242 12(3)	G&H
			Aug 3, 21	14 7,15 8	34 33 8W					16		G&H
			Jul 11, 23	11 3,13 6	34 27 8W	12 5	75 51 1 N	12 5	*13585*	*241*	241 567	RHG
			Jul 12, 23	14 0,16 7	34 26 8W	15 3	75 48 9 N	15 3	*13620*	*241*	241 567	RHG
Battle Harbor, *D*	52 16 4 N	304 25	Aug 1, 21			12 3	75 53 8 N				242 12	G&H
			Aug 2, 21	14 1,16 4	34 30 4W			14 7,15 9	13618	16		G&H
			Aug 30, 22	14 0,14 2 17 2	34 28 8W	15 5	75 53 2 N	15 5	*13596*	*241*	241 567	RHG
Red Bay	51 43 8 N	303 34	Jul 7, 23	15 9,18 6	34 29 0W	17 3	76 13 7 N	17 4	*13250*	*241*	241 567	RHG
Bonne Bay	49 33 5 N	302 02	Jul 29, 21			15 1	75 21 7 N	15 6	*14563*	*242*	242 12	GDH
St Johns, *C*	47 34 4 N	307 16	Oct 6, 22	14 8,15 2	29 31 1W	16 6	73 06 0 N	16 6	*15871*	*242*	242 56(1)	GDH
			Oct 7, 22	10 0,10 2	29 33 4W					*242*		GDH

UNITED STATES

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Deering	66 05 5 N	197 18	Jul 8, '22	16 7	21 30 1 E			16 9	13310	8		HUS
			Jul 9, 22	11 2,14 3,18 0	21 36 0 E	16 6	76 20 2 N	12 0,13 7	13296	8	205 123	HUS
			Jul 9, 22					16 6	*13318*	*205*		HUS
			Jul 12, 22	11 8,16 0	21 34 4 E	13 9	76 21 1 N			8	205 123	HUS
			Jul 12, 22			14 0	76 20 8 N	13 9	*13297*	*205*	205 67(3)	HUS
			Jul 12, 22	12 3,15 7	21 36 0 E			14 0	*13344*	*205*		HUS
Greenport, *Eclipse Absolute Station*	41 06 5 N	287 38	Jan 13, 25	14 4,16 3	12 20 6 W	17 2,17 4	72 29 2 N	14 9,15 9	17451	26	EI 26	A&G
			Jan 21, 25	9 3,10 9	12 15 6 W	11 6,11 9	72 30 5 N	9 8,10 6	17434	26	EI 26	A&G
			Jan 25, 25	14 4,15 9	12 18 8 W			14 7 15 5	17439	26		A&G
			Jan 26, 25			14 5,14 8	72 29 4 N				EI 26	A&G
			Jan 31, 25	9 5,12 2	12 17 6 W	15 2,15 5	72 28 8 N	10 3,11 8	17430	26	EI 26	A&G
Washington (Rock Creek Park)	38 57 5 N	282 57	Jun 23, 21	14 0,16 4	3 08 4W			14 7	18668	16		GDH
			Jun 24, 21			15 2	71 14 4 N	11 2,13 0	18652	16	242 123	GDH
Washington, S M O, N_m[1]			*1921*									
	38 57 4 N	282 56	Apr 27	15 5	4 54 7W					3		HWF
			Apr 28,29	9 3–16 3 (6)	4 56 8 W			11 2–15 8	18678	3		HWF
			May 14	11 3–12 3 (4)	4 51 3 W					3		HWF
			May 16,17	9 8,14 0,16 1	4 55 0 W			10 4–14 8	18617	3		HWF
			May 20,21, 23					9 1–16 7	18658	3		HWF
			May 25,26, 27	9 8–14 6 (7)	4 54 7 W			10 9–15 8	18673	3		HWF
			Jun 3, 4					9 4–16 0	18695	3		HWF
			Aug 5					10 0–15 8	18656	3		HWF
			Aug 8					0 4–2 1	18674	3		HWF
			Nov 30					15 5	18671	3		HRG
			Dec 1	8 5–16 1 (dv)	4 55 8 W					3		HRG
			Dec 2	13 3–14 2 (4)	4 57 0 W			9 9–15 8	18655	3		HRG
			Dec 3	8 3–16 2 (dv)	4 56 4 W					3		HFJ
			Dec 5	9 4–16 4 (4)	4 54 3 W					3		J&G
			Dec 8	10 1–11 9 (6)	4 54 4 W					3		HRG
			1922									
			Sep 8, 9	9 8–15 5 (6)	5 00 5 W			9 4–15 9	18598	3		HFJ
			Oct 18,19	9 4–15 0 (6)	5 01 5 W			10 3–14 7	18602	3		HFJ
			Nov 2, 3	9 7–16 8 (5)	5 02 4 W			10 6–16 4	18596	3		HWF
			Nov 4, 6	9 4–15 2 (7)	5 01 1 W			10 0–15 7	18594	3		HWF
			Nov 22	11 3,16 4	5 01 8 W			13 6,15 6	18609	3		HFJ
			Dec 4, 5	13 7,16 0	5 02 7 W					3		HFJ
			Dec 6	9 6–15 8 (6)	5 04 1 W					3		WCP
			1923									
			Feb 25,26					1 5–5 6	18582	3		HWF
			Mar 2					1 3–4 7	18595	3		HWF
			May 29	15 8,16 2,16 5	5 04 7 W					3		HFJ
			Aug 4	12 3,12 6,13 5	5 06 8 W					3		HFJ
			Aug 6					10 3–15 8	18570	3		HFJ
			Aug 7	9 7–15 9 (7)	5 05 8 W			11 4,13 9	18578	3		HFJ

[1] The values given for declination at station Washington, S M O, N_m, should all be 0′ 1 greater west

NORTH AMERICA

UNITED STATES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′	*1923*	h h h	° ′	h h	° ′	h h	c g s			
Washington, S M O, N_m[1]—*Concluded*	38 57 4 N	282 56	Aug 9,11,13	9 1–16 1 (12)	5 07 4 W					3		HFJ
			Oct 5	15 2	5 08 9 W			15 7	18572	3		OWT
			Oct 6, 8	10 4–14 5 (6)	5 05 1 W			9 7–13 8	18559	3		OWT
			1924									
			Feb 4,5,7	10 4–14 1 (7)	5 06 6 W			9 8–15 6	18545	3		JWG
			Feb 13,14	10 5–15 0 (9)	5 04 7 W					3		JWG
			Mar 1, 3	9 4–15 8 (6)	5 06 5 W			10 0–15 3	18550	3		RTB
			Mar 4	9 5–16 1 (6)	5 06 1 W			10 0–15 7	18545	3		JWG
			May 23,24	10 2–14 8 (6)	5 07 0 W			9 7–15 3	18511	3		JWG
			May 26	10 4,10 7,11 0	5 05 0 W					3		JWG
			Sep 24	9 4–16 5 (6)	5 07 7 W			9 9–16 0	18493	3		CML
			Oct 8, 9	9 3–16 1 (7)	5 09 0 W			10 3–15 2	18505	3		JWG
			Oct 15,16	9 1–16 1 (6)	5 07 1 W			10 2–15 0	18505	3		JWG
			Oct 28,29	9 3–15 6 (6)	5 07 7 W			9 8–15 2	18494	3		JWG
			Oct 30	14 3,14 7	5 10 2 W					3		JWG
			Dec 2	15 1	5 09 1 W					3		HWF
			Dec 3	11 8–15 6 (4)	5 08 7 W			9 9–17 0	18514	3		HWF
			Dec 4	9 4	5 05 2 W					3		HWF
			Dec 8	12 4,13 6,14 1	5 11 2 W					3		HWF
			1925									
			Apr 13,14					9 6–15 2	18497	3		JPA
			Apr 13,14,15	9 0–16 2 (6)	5 09 4 W					3		JPA
			Jul 23,24	9 7–15 3 (6)	5 11 3 W			9 4–15 8	18489	3		JPA
			Nov 10,11,12	10 6–15 5 (6)	5 12 2 W			9 9–16 0	18423	3		HWF
			Nov 20,21,24					9 9–15 7	18463	3		HWF
			1926									
			Jan 7, 8	9 2–16 1 (8)	5 11 9 W			9 7–15 1	18436	3		WFW
			Mar 11,12	9 4–15 9 (6)	5 13 3 W			9 6–14 9	18415	3		F&W
			May 20,21	9 8–15 3 (6)	5 13 0 W			9 3–15 7	18434	3		WFW
			Jun 21,22	10 8–14 8 (6)	5 15 6 W			10 2–15 3	18449	3		HWF
			Jul 8	13 5–15 3 (6)	5 18 7 W					3		HWF
			Jul 20	9 7,15 2	5 12 6 W			11 2,14 0	18440	3		WFW
			Jul 21	10 7,15 9	5 12 0 W					3		WFW
			Aug 3, 4	9 6,15 6 (7)	5 14 9 W			9 7–14 7	18417	3		WFW
Washington, S M O, S_m[1]	38 57 4 N	282 56	*1921*									
			Apr 30, May 2	9 7–15 8 (6)	4 53 8 W			10 4–15 2	18676	3		HWF
			May 10,11,12,13	9 5–16 1 (9)	4 55 0 W					3		HWF
			May 11,12,13,14					9 9–16 0	18687	3		HWF
			May 27,28,31	11 0–16 3 (6)	4 57 2 W			10 0–15 9	18659	3		HWF
			Jun 1	10 7	4 54 7 W					3		HWF
			Jun 2	9 3,12 2	4 56 0 W			10 2–16 9	18663	3		HWF
			Jun 4					11 3–11 8	18659	3		HWF
			Jun 14	15 9	4 54 1 W					3		HWF
			Jun 15,16	10 3–14 8 (6)	4 54 8 W			9 8–15 9	18677	3		HWF
			Jun 29,30	10 4–15 6 (7)	4 55 7 W			10 3–15 7	18675	3		HWF
			Jul 5, 6	11 0–14 3 (5)	4 54 4 W					3		HWF
			Jul 6, 7					9 7,16 3	18696	3		HWF
			Jul 26,27	10 4–15 8 (10)	4 56 9 W					3		HWF
			Aug 2, 4					10 0–15 7	18678	3		HWF
			Aug 8					3 5–5 2	18667	3		HWF
			Nov 17,18,19					9 6–15 6	18620	3		F&G
			Nov 23	8 4, 9 4	4 56 1 W					3		HRG
			Nov 26,28					9 6–15 7	18643	3		HRG
			Nov 29	14 7–15 7 (4)	4 55 0 W			9 7–13 8	18652	3		HRG
			Nov 30	8 2–14 8 (dv)	4 54 2 W					3		G&J
			Dec 7					10 2–14 5	18650	3		HWF
			1922									
			Feb 21	11 7,11 9	4 57 2 W					3		HFJ
			Feb 23					10 9–14 5	18648	3		HFJ
			Feb 23,24	9 3–15 9 (4)	4 55 7 W					3		HFJ
			Mar 13,14	10 5–15 8 (6)	5 01 8 W			10 8–15 6	18590	3		HWF
			Mar 27,28	9 9–16 1 (8)	4 58 8 W			10 6–15 2	18619	3		HWF
			Apr 1	10 1,10 6,11 0	4 52 7 W					3		HWF
			Apr 24,25	9 8–15 6 (9)	5 01 6 W			9 8–14 6	18612	3		HFJ

[1] The values given for declination at station Washington, S M O, N_m and S_m, should all be 0′ 1 greater west

NORTH AMERICA

UNITED STATES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
Washington, S M O, S_m[1]—*Concluded*	° ′	° ′	*1922*	h h h	° ′	h h	° ′	h h	c g s			
	38 57 4 N	282 56	May 1, 2	10 8–15 9 (8)	4 58 2 W			10 0–15 4	18625	3		HFJ
			May 8, 9	9 5–16 0 (7)	5 02 2 W			10 1–15 0	18608	3		HFJ
			May 22,23	11 4–16 1 (8)	5 00 4 W					3		JWG
			May 22,23, 25					10 3–14 8	18643	3		JWG
			Sep 7, 8	10 1–16 2 (6)	5 00 3 W			10 8–15 6	18565	3		HFJ
			Oct 16,17	9 8–16 4 (6)	5 01 5 W			10 5–16 0	18596	3		HFJ
			Oct 21,23	10 1–16 1 (5)	5 01 3 W			11 1–15 5	18598	3		HFJ
			Oct 24	11 0	5 02 3 W			10 0,15 3	18596	3		HFJ
			Oct 25,26	10 0,11 1,14 3	5 01 1 W					3		HFJ
			Oct 27,30	9 6–16 3 (4)	4 59 4 W					3		HFJ
			Oct 27,28, 30					10 4–15 7	18589	3		HFJ
			Oct 31, Nov 1, 2	9 6–15 8 (8)	5 01 0 W			10 4–16 0	18581	3		HWF
			1923									
			Feb 21,22,23					1 1– 4 6	18594	3		HWF
			Mar 3					2 8– 5 3	18596	3		HWF
			May 29	16 9,17 1,17 4	5 01 4 W					3		HFJ
			May 30,31					10 5–14 1	18567	3		HFJ
			Jun 12	14 9–16 1 (4)	5 04 4 W					3		HWF
			Jun 14					9 9–13 7	18556	3		HWF
			Aug 1					15 0	18610	3		HFJ
			Aug 2, 3	9 6–16 2 (7)	5 04 9 W			10 2–15 1	18581	3		HFJ
			Aug 4					9 8,11 4	18555	3		HFJ
			Oct 3	11 4,16 0	5 05 8 W					3		OWT
			Oct 4, 5	9 6–14 6 (6)	5 05 0 W			9 7,15 2	18558	3		OWT
			1924									
			Feb 7, 8	10 9–16 2 (6)	5 08 1 W			10 3–15 8	18531	3		JWG
			Feb 13	13 6–14 2 (4)	5 06 6 W					3		JWG
			Feb 14	13 5–15 3 (6)	5 06 7 W					3		JWG
			Feb 28,29	9 5–15 6 (6)	5 06 6 W			10 3–15 1	18535	3		RTB
			Mar 5	9 2–15 9 (6)	5 08 6 W			9 6–15 6	18540	3		JWG
			May 28	9 3–14 9 (7)	5 10 0 W			9 8–16 0	18518	3		JWG
			May 29	9 1, 9 5	5 03 0 W					3		JWG
			Sep 22,23	9 3–15 9 (6)	5 09 5 W			9 7–15 1	18515	3		CML
			Oct 10,11	9 1–16 1 (7)	5 08 2 W			10 5–14 9	18495	3		JWG
			Oct 13,14	9 7–16 2 (8)	5 10 2 W			10 7–15 3	18490	3		JWG
			Oct 29,30	9 2–16 2 (8)	5 10 6 W			9 7–15 8	18493	3		JWG
			Dec 4, 5	9 6–15 2 (8)	5 09 2 W			10 1–14 8	18504	3		HWF
			Dec 8	9 4–11 9 (6)	5 09 6 W					3		HWF
			1925									
			Apr 15,16					10 3–15 5	18488	3		JPA
			Apr 15,16, 18	9 3–16 1 (9)	5 11 3 W					3		JPA
			Jul 22,23	10 5–16 1 (6)	5 13 2 W			9 4–15 4	18479	3		JPA
			Nov 12,13 16					9 8–15 9	18426	3		HWF
			Nov 12,13, 14,16	9 3–14 5 (7)	5 13 6 W					3		HWF
			Nov 19,20					10 1–14 5	18438	3		HWF
			Nov 24					13 7,14 7	18462	3		HWF
			1926									
			Jan 6, 7	9 2–16 1 (7)	5 13 5 W			9 7–15 7	18432	3		WFW
			Mar 12,13	9 8–15 7 (4)	5 12 2 W			9 3–16 1	18398	3		HWF
			Mar 15	9 6,10 0	5 07 3 W					3		HWF
			May 19,20	9 8–15 8 (6)	5 15 7 W			10 3–15 3	18435	3		WFW
			Jun 22,23, 24	10 3–14 7 (6)	5 16 2 W			9 7–15 2	18422	3		HWF
			Jul 8	9 7–12 2 (7)	5 12 7 W					3		HWF
			Aug 4, 5	10 8–15 3 (6)	5 18 4 W			10 0–15 8	18421	3		WFW
			1921									
Washington S M O N_m	38 57 4 N	282 56	May 2			15 3,16 2	71 09 2 N				EI 48	HWF
			May 3			9 7–11 6	71 09 0 N				EI 48	HWF
			May 18			15 6	71 11 6 N				EI 48	HWF
			May 19			10 0–13 4	71 13 3 N				EI 48	HWF
			Nov 21			10 9–15 5	71 12 3 N				EI 48	HWF
			Nov 22			9 5–11 2	71 11 1 N				EI 48	HWF
			1922									
			Mar 31			11 8–16 2	71 12 0 N				EI 48	HWF
			Apr 12			10 0–14 2	71 12 2 N				EI 48	HWF

[1] The values given for declination at station Washington, S M O, N_m and S_m, should all be 0′ 1 greater west

NORTH AMERICA

UNITED STATES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° '	° '	*1922*	h h h	° '	h h	° '	h h	c g s			
Washington, S M O, *N.—Concluded*	38 57 4 N	282 56	Apr 13			14 0–15 9	71 11 1 N				EI 48	HWF
			Apr 25			15 3,15 9	71 11 3 N				EI 48	WAL
			Apr 26			9 8–14 2	71 12 1 N				EI 48	HFJ
			May 15			11 0–15 9	71 11 2 N				EI 48	JWG
			May 26			9 9–12 1	71 10 6 N				EI 48	JWG
			Sep 11			9 1–11 9	71 12 6 N				EI 48	HFJ
			Oct 20			9 7–11 8	71 13 2 N				EI 48	HFJ
			Nov 9			11 3–15 4	71 11 1 N				EI 48	HWF
			Dec 4,5,6			10 2–15 5	71 11 9 N				EI 48	HFJ
			1923									
			May 7			13 5–15 5	71 11 4 N				EI 48	HFJ
			May 8			10 4,11 2	71 12 4 N				EI 48	HFJ
			Oct 10			10 9–15 5	71 12 6 N				EI 48	OWT
			1924									
			Mar 6			14 5–16 0	71 13 5 N				EI 48	JWG
			Mar 7			9 2, 9 6	71 13 5 N				EI 48	JWG
			Apr 11			13 6–15 6	71 11 9 N				EI 48	JL
			Apr 12			9 4–12 5	71 11 8 N				EI 48	JL
			Apr 14			9 4–11 5	71 12 2 N				EI 48	JL
			May 29			11 8–16 1	71 12 2 N				EI 48	JWG
			May 31			9 5–10 7	71 13 8 N				EI 48	JWG
			Sep 25			15 4,15 8	71 13 5 N				EI 48	CML
			Sep 26			9 4–10 8	71 14 8 N				EI 48	CML
			Oct 8			13 6,15 6	71 13 4 N				EI 48	JWG
			Oct 9			9 8–15 6	71 14 6 N				EI 48	JWG
			Oct 15			10 1–15 7	71 13 4 N				EI 48	JWG
			Oct 16			9 6,11 6	71 14 8 N				EI 48	JWG
			Nov 3			10 0–10 9	71 13 8 N				EI 48	JWG
			Dec 6, 7			14 4–16 2	71 12 9 N				EI 48	HWF
			1925									
			Apr 17			10 1–14 3	71 14 0 N				EI 48	JPA
			Jul 27			9 4–11 8	71 15 0 N				EI 48	JPA
			Nov 20			15 0,16 4	71 14 1 N				EI 48	HWF
			Nov 21			9 3–12 7	71 15 3 N				EI 48	HWF
			Nov 24			9 9,11 0	71 13 5 N				EI 48	HWF
			1926									
			Jan 11,12			10 3–15 9	71 14 9 N				EI 48	WFW
			Mar 15,16			13 6–15 6	71 16 1 N				EI 48	WFW
			May 21			13 6–15 9	71 14 5 N				EI 48	WFW
			Jun 29,30			10 0–13 6	71 15 3 N				EI 48	HWF
			Aug 5, 6			9 5–15 9	71 15 3 N				EI 48	WFW
Washington, S M O, *S.*	38 57 4 N	282 56	*1921*									
			May 3, 4			10 6–16 2	71 09 8 N				EI 48	HWF
			May 18			10 0–14 2	71 13 0 N				EI 48	HWF
			May 20,21			9 5,13 8	71 12 8 N				EI 48	HWF
			May 23			9 7–16 6	71 12 4 N				EI 48	HWF
			Jun 8, 9, 10			9 6–16 2	71 09 9 N				EI 48	HWF
			Jun 13			10 7–15 4	71 09 5 N				EI 48	HWF
			Jul 5,6,7			9 8–16 3	71 09 8 N				EI 48	HWF
			Jul 28,29			10 6–15 5	71 10 4 N				EI 48	HWF
			Nov 22,23			10 3–15 7	71 11 2 N				EI 48	HWF
			Nov 25,26			9 6–16 2	71 11 2 N				EI 48	HWF
			Nov 28			9 6–12 2	71 11 2 N				EI 48	HWF
			Nov 30			12 1	71 11 3 N				EI 48	HWF
			Dec 1,2,3			11 2–16 0	71 10 5 N				EI 48	HFW
			Dec 5,6,7			10 0–16 0	71 10 7 N				EI 48	HFW
			1922									
			Apr 26,27, 28			9 6–16 0	71 12 4 N				EI 48	HFJ
			May 12,13			9 4–16 1	71 12 1 N				EI 48	JWG
			May 15			9 5–10 3	71 12 2 N				EI 48	JWG
			May 26			13 7–16 1	71 09 6 N				EI 48	JWG
			Sep 11			13 5–16 2	71 11 4 N				EI 48	HFJ
			Oct 16,17, 18,19, 20			9 4–17 3	71 12 4 N				EI 48	HFJ
			Oct 24,25, 26,27, 28			9 4–16 3	71 12 4 N				EI 48	HFJ
			Oct 30			10 3–14 3	71 12 2 N				EI 48	HFJ

NORTH AMERICA

UNITED STATES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′	*1922*	h h h	° ′	h h	° ′	h h	c g s			
Washington, S M O, S_s—*Concluded*	38 57 4 N	282 56	Nov 8, 9			9 7–16 1	71 11 6 N				EI 48	HWF
			1923									
			May 8			13 1–16 0	71 11 5 N				EI 48	HFJ
			May 29,30, 31			9 1–14 7	71 13 3 N				EI 48	HFJ
			Jun 12,14			9 9–14 2	71 12 4 N				EI 48	HWF
			Aug 14			11 6–16 0	71 11 6 N				EI 48	HFJ
			Oct 9,10, 11			9 5–16 3	71 13 3 N				EI 48	OWT
			1924									
			Mar 6, 7			10 4–13 8	71 14 0 N				EI 48	JWG
			Apr 9,10, 11			9 7–16 0	71 12 6 N				EI 48	JL
			Jun 2			10 8–13 6	71 13 6 N				EI 48	JWG
			Sep 25			11 1,14 4	71 14 6 N				EI 48	CML
			Oct 10,11			10 0–15 3	71 14 6 N				EI 48	JWG
			Oct 13,14			10 2–15 8	71 14 5 N				EI 48	JWG
			Nov 3			11 8–14 6	71 14 0 N				EI 48	JWG
			Dec 5, 6			10 0–16 8	71 13 1 N				EI 48	HWF
			1925									
			Apr 17,18			9 3–16 4	71 13 6 N				EI 48	JPA
			Jul 24			12 0–14 8	71 13 5 N				EI 48	JPA
			Nov 19, 20			9 5–15 4	71 15 6 N				EI 48	JPA
			Nov 24			13 7,14 6	71 14 6 N				EI 48	JPA
			1926									
			Jan 9, 11			9 4–11 7	71 15 6 N				EI 48	WFW
			Mar 17			14 0–16 1	71 15 7 N				EI 48	WFW
			May 22			9 6–12 0	71 16 1 N				EI 48	WFW
			Jun 28, 29			9 6–15 2	71 13 6 N				EI 48	HWF
			Aug 6			12 2–16 1	71 14 1 N				EI 48	WFW
			1921									
Washington, S M O, E_m[1]	38 57 4 N	282 56	Jun 14			9 8–13 8	71 10 4 N				EI 48	HWF
			Jun 16	15 7	4 53 7 W					3		HWF
			Jun 17,18	9 5–16 2 (6)	4 53 8 W			10 0–15 1	18677	3		HWF
			Jul 1, 2	12 1–16 3 (5)	4 56 0 W			10 5–15 3	18680	3		HWF
			Jul 27,28	10 6–16 1 (6)	4 57 4 W					3		HWF
			Jul 30			10 0–12 1	71 11 0 N				EI 48	HWF
			Aug 1			10 1–11 3	71 10 6 N				EI 48	HWF
			Aug 9,10					10 2–16 4	18661	3		HWF
			Nov 23			13 2–15 2	71 12 6 N				EI 48	HWF
			Dec 8	14 2–15 2 (4)	5 00 4 W					3		HWF
			Dec 9,10	9 8–15 5 (5)	4 56 0 W			11 0–16 0	18660	3		HWF
			1922									
			Feb 12	15 7	4 58 3 W					3		HRG
			Feb 21	10 0–11 0 (4)	4 58 0 W					3		HFJ
			Mar 15,16	9 5–16 4 (6)	4 59 1 W			10 0–15 9	18619	3		HWF
			Mar 28,29	9 7–16 8 (6)	5 02 4 W			10 4–16 4	18633	3		HWF
			Apr 18,19, 20	9 6–15 7 (7)	5 02 5 W			10 1–16 0	18635	3		HFJ
			May 2,3,4	10 9–16 1 (8)	5 02 4 W					3		HFJ
			May 3, 4					10 3–15 8	18637	3		HFJ
			May 4,5,6	9 7–16 1 (7)	5 02 3 W					3		HFJ
			May 5, 6					10 2–15 3	18634	3		HFJ
			May 24,25	9 4–16 1 (9)	5 02 6 W			10 0–15 0	18628	3		JWG
			1923									
			Feb 23,24					1 2– 4 9	18609	3		HWF
			Aug 15			10 1–13 8	71 13 2 N				EI 48	HWF
			1924									
			May 26,27	12 0–16 2 (6)	5 08 3 W			10 4–15 2	18532	3		JWG
			May 31			11 5–12 7	71 13 3 N				EI 48	JWG
			Jun 2			9 6, 9 9	71 14 0 N				EI 48	JWG
			1924									
Cheltenham, B_s	38 44 0 N	283 10	Mar 18,19, 20					8 2–17 0	18932	3		JWG
			Mar 20	10 8–16 7 (8)	6 36 0 W					3		JWG
			Mar 21	10 9–16 1 (4)	6 36 4 W			8 5–15 4	18932	3		JWG
			1924									
Cheltenham, (*EI*)	38 44 0 N	283 10	Mar 19,20, 21			8 0–15 1	70 59 4 N				EI 48	JWG
San Rafael	37 58 6 N	237 27	Mar 18 '21	10 5,11 9	18 20 0 W	14 6,14 7	62 13 4 N	11 0,11 6	24736	25	EI 25	CVI

[1] The values given for declination at station Washington, S M O, E_m, should all be 0′1 greater west

NORTH AMERICA

UNITED STATES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
San Francisco, *Fort Scott, A*	37 48 7 N	237 31	Feb 26, '21	10 8,12 7	18 08 0 E			11 3,12 2	24714	5		C VI
			Feb 28, 21	13 3,13 4,13 8	18 05 4 E			9 3,10 1	24738	5		C VI
			Feb 28, 21	14 0,14 5,14 7	18 04 5 E			10 9,11 7	24714	5		C VI
			Feb 28, 21	15 1,15 3	18 05 2 E					26		C VI
			Feb 28, 21	15 6,15 8	18 05 4 E					26		C VI
			Mar 1, 21	13 0,13 2	18 05 4 E			9 1,10 0	24740	26		C VI
			Mar 1, 21	13 5,13 7	18 05 8 E			10 8,11 6	24736	26		C VI
			Mar 1, 21					14 1,14 8	24727	26		C VI
			Mar 2, 21			11 1 to 13 3 (6)	62 16 8 N				EI 25	C VI
			Mar 2, 21			13 9 to 15 2 (6)	62 16 1 N				EI 26	C VI
			Mar 3, 21	13 4,13 6,14 0	18 06 8 E			9 5,10 6	24729	5		C VI
			Mar 3, 21	14 3,14 7,14 8	18 06 6 E			11 3,12 9	24704	5		C VI
			Mar 3, 21	15 4,15 6	18 06 4 E					5		C VI
			Mar 4, 21					10 0,11 8	24722	5		C VI
			Mar 4, 21					13 9,14 7	24725	5		C VI
			Mar 4, 21					15 2	24726	5		C VI
			Mar 7, 21					9 4 to 15 3 (7)	24716	5		C VI
			Mar 8, 21					13 9,14 6	24726	5		C VI
			Mar 8, 21					15 1	24739	5		C VI
			Mar 9, 21			9 8 to 15 3 (9)	62 15 7 N	10 3 to 14 9 (6)	24724	5	EI 25	C VI
			Mar 10, 21			11 0 to 13 9 (7)	62 16 7 N				EI 7	C VI
			Mar 15, 21	10 5 to 13 5(dv)	18 06 9 E					25		C VI
San Francisco, *Fort Scott, B*	37 48 7 N	237 31	Feb 26, 21	10 8,12 7	18 05 1 E			11 3,12 2	24694	26		C VI
			Feb 28, 21	13 3,13 4,13 8	18 02 5 E			9 3,10 1	24728	26		C VI
			Feb 28, 21	14 0,14 5,14 7	18 01 9 E			10 9,11 7	24715	26		C VI
			Feb 28, 21	15 1,15 3	18 02 2 E					5		C VI
			Feb 28, 21	15 6,15 8	18 02 6 E					5		C VI
			Mar 1, 21	13 0,13 2	18 03 4 E			9 1,10 0	24732	5		C VI
			Mar 1, 21	13 5,13 7	18 03 4 E			10 8,11 5	24730	5		C VI
			Mar 1, 21					14 1,14 8	24724	5		C VI
			Mar 2, 21			9 4 to 13 3 (10)	62 19 1 N				EI 26	C VI
			Mar 2, 21			13 9 to 15 2 (6)	62 18 7 N				EI 25	C VI
			Mar 3, 21	13 4,13 6,14 0	18 03 9 E			9 5,10 6	24716	25		C VI
			Mar 3, 21	14 3,14 7,14 8	18 03 1 E			11 3,12 9	24710	25		C VI
			Mar 3, 21	15 4,15 6	18 03 5 E					25		C VI
			Mar 4, 21					10 0 11 8	24724	25		C VI
			Mar 10, 21			10 4 to 16 0 (14)	62 20 0 N				EI 25	C VI
			Mar 11, 21			9 2 to 14 4 (9)	62 18 5 N	12 9 13 8	24736	5	EI 25	C VI
			Mar 14, 21	15 1 to 17 6(dv)	18 02 7 E					5		C VI
			Mar 16, 21	7 9 to 9 4(dv)	18 06 9 E					5		C VI
			Mar 16, 21	15 0 to 17 6(dv)	18 04 3 E					5		C VI
			Mar 17, 21	7 3 to 9 3(dv)	18 08 1 E					5		C VI
Bristol	36 36 2 N	277 49	May 4, 25	10 2,13 5	1 17 4 W	14 9,15 2	68 41 4 N	11 4,12 8	20708	25	EI 25	AHK
			May 5, 25	6 4 to 17 6(dv)	1 10 2 W			6 4 to 17 6 (dv)	20736	25		AHK
Dalton, *A*	34 46 3 N	275 02	May 2, 25	12 9,15 8	1 47 6 E	11 3,11 6	66 49 4 N	13 8,15 0	22324	25	EI 25	AHK
Dalton, *B*	34 46 3 N	275 02	May 2, 25	10 3,13 6	1 47 8 E	14 2,14 4	66 47 4 N	11 3,11 7	22318	26	EI 26	JES
Whiteville, *A*	34 21 3 N	281 18	Apr 21, 25	14 5,15 7	2 13 1 W	12 9,13 1	66 57 0 N	15 0	21856	26	EI 26	JES
Whiteville, *B*	34 21 3 N	281 18	Apr 21, 25	15 2	2 34 4 W			15 8	21886	25		AHK
Mount Wilson Observatory, *Magnetic Observatory Site*	34 13 0 N	241 56	Aug 26, 26	15 1	15 13 4 E	17 6	59 45 2 N	15 8	25720	17	EI 17	F&N
Florence, *A*	34 12 7 N	280 11	Apr 20, 25	12 6	1 36 2 W					26		JES
Florence, *B*	34 12 7 N	280 11	Apr 20, 25	12 6	1 38 3 W					25		AHK
			Apr 20, 25	14 0	1 35 3 W	17 2,17 4	67 02 2 N	14 7,15 9	21766	26	EI 26	JES
Point Loma, *A*	32 40 2 N	242 46	Sep 5, 23	10 4,12 6	14 44 5 E			10 9,12 3	26831	12		A&S
			Sep 7, 23	10 6	14 37 8 E					13		A&S
			Sep 7, 23	11 4 to 16 4 (6)	14 40 3 E					13		A&S
			Sep 8, 23	12 1	14 39 1 E					13		A&S
			Sep 9, 23	9 2,17 0	14 45 1 E					13		A&S
			Sep 9, 23	9 6 to 16 2(dv)	14 43 3 E					13		A&S
			Sep 10, 23	9 0,17 0	14 49 2 E					13		A&S

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UNITED STATES—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Point Loma, *A—Concluded*	32 40 2 N	242 46	Sep 10, 23	9 6 to 16 2(dv)	14 46 4 E					13		A&S
			Sep 11 23	10 9 to 16 2(dv)	14 44 8 E					13		A&S
			Sep 11 23	17 0	14 47 2 E					13		A&S
			Sep 13, 23	8 5, 9 8	14 47 8 E			8 8, 9 5	26842	12		A&S
Point Loma, *B*	32 40 2 N	242 46	Sep 7, 23			13 8,14 7	58 24 0 N				EI 7	JPA
			Sep 9, 23			9 7, 9 9	58 22 8 N				EI 7	JPA
			Sep 9, 23			10 2 to 16 2 (dv)	58 24 4 N				EI 7	JPA
			Sep 9, 23			16 5,16 6	58 24 4 N				EI 7	JPA
			Sep 10, 23			9 4, 9 7	58 24 3 N				EI 7	JPA
			Sep 10 23			10 2 to 16 2 (dv)	58 24 1 N				EI 7	JPA
			Sep 10, 23			16 6,16 8	58 23 8 N				EI 7	JPA
			Sep 11, 23			11 1 to 16 2(dv)	58 25 6 N				EI 7	JPA
			Sep 11, 23			16 5,16 7	58 25 2 N				EI 7	JPA
			Sep 12, 23			16 6,16 7	58 23 8 N				EI 7	JPA
Sweetwater, *A*	32 28 0 N	259 36	Aug 22, 24	13 2,14 4	10 45 6 E	12 6,12 7	61 57 0 N	13 6,14 2	25676	26	EI 26	JWG
			Aug 23, 24			6 3 to 18 0 (dv)	61 59 3 N				EI 26	JWG
			Aug 24, 24	6 3 to 18 0(dv)	10 47 1 E			6 3 to 18 0 (dv)	25677	26		JWG
Sweetwater, *B*	32 28 0 N	259 35	Aug 25, 24	10 1,11 5	10 46 2 E	12 6,12 8	61 57 8 N	10 5,11 2	25660	26	EI 26	JWG
Tucson, *B*	32 14 8 N	249 10	Aug 11, 24	8 5, 9 9,10 2	13 48 3 E	15 0,15 3	59 30 3 N	8 9, 9 4	26740	26	EI 26	JWG
			Aug 11, 24	11 4,13 0,14 2	13 43 5 E	15 7,16 0	59 30 2 N	10 6,11 1	26740	26	EI 26	JWG
			Aug 11, 24			16 2,16 5	59 30 0 N	13 1,14 0	26751	26	EI 26	JWG
Tucson Observatory, *Inductor Pier*	32 14 8 N	249 10	Aug 12, 24			8 8, 9 1	59 29 2 N				EI 26	JWG
			Aug 12, 24			9 4, 9 7	59 29 2 N				EI 26	JWG
			Aug 12, 24			10 1,10 4	59 28 9 N				EI 26	JWG
Tucson Observatory, *Magnetometer Pier*	32 14 8 N	249 10	Aug 12, 24	11 1,13 4,13 8	13 43 2 E			11 2,13 1	26751	26		JWG
			Aug 12, 24	15 2,15 6,16 9	13 45 9 E			14 2,14 8	26754	26		JWG
			Aug 12 24					15 9,16 5	26735	26		JWG
			Aug 13, 24	6 0 to 17 7 (dv)	13 44 8 E			6 0 to 17 7 (dv)	26737	26		JWG
Waycross, *A*	31 14 1 N	277 39	Jun 21, 22	9 7,13 1	1 00 2 E	14 5,14 8	63 35 6 N	10 2,11 0	24379	25	EI 25	JWG
			Jun 22, 22	6 4 to 17 9 (dv)	1 00 0 E			6 7 to 17 7 (dv)	24392	25		JWG
			Apr 22, 25	10 8,12 8	0 52 0 E	13 8,14 2	63 43 9 N	11 3 12 3	24183	26	FI 26	JES
			Apr 23, 25	6 0 to 17 5 (dv)	0 53 8 E			6 0 to 17 5 (dv)	24172	26		JES
			Apr 25, 25	8 5,11 4	0 50 6 E	14 6,15 1	63 43 8 N	9 1, 10 5	24183	25	EI 25	AHK
Waycross, *B*	31 14 1 N	277 39	Jun 21, 22	11 6,15 1	0 58 4 E	16 6,16 8	63 35 8 N	13 2,14 5	24424	26	EI 26	WAL
			Jun 22, 22			6 2 to 18 0 (dv)	63 35 7 N				EI 26	WAL
			Apr 22, 25	11 8	0 53 9 E			13 5	24202	25		AHK
			Apr 23 25			15 1,15 6	62 42 4 N	16 7	24237	25	EI 25	AHK
			Apr 24, 25	10 6	0 55 2 E					25		AHK
			Apr 25, 25			6 7 to 16 9 (dv)	62 41 9 N				EI 26	JES
Jacksonville, *A*	30 22 2 N	278 20	Apr 30, 25	13 3,15 5	0 56 8 E	10 9,11 0	63 13 3 N	13 8,14 5	24253	26	EI 26	JES
Jacksonville, *B*	30 22 2 N	278 20	Apr 30, 25	14 8	0 57 1 E	14 0	63 14 6 N	15 5,16 1	24275	25	EI 25	AHK
Bunnell, *A*	29 27 6 N	278 44	Apr 27, 25	14 0,16 2	1 00 1 E			14 7,15 7	24691	26		JES
			Apr 28, 25	8 9,10 8	1 06 0 E	11 4 11 6	62 17 8 N	9 3,10 2	24688	26	EI 26	JES
			Apr 28, 25			17 2,17 5	62 19 0 N				EI 26	JES
Bunnell, *B*	29 27 6 N	278 44	Apr 27, 25	15 9	1 00 0 E			16 7	24681	25		AHK
			Apr 28 25	9 3	1 08 1 E	17 3,17 6	62 20 4 N	9 9,11 4	24707	25	FI 25	AHK
Miami, *A*	25 46 3 N	279 49	Jun 26, 22	12 9,13 5	1 32 0 E	10 4,10 7	58 22 5 N	14 2,15 2	26916	25	EI 25	JWG
			Jun 27, 22	7 3, 7 6	1 38 1 E	14 5,14 7	58 25 3 N	8 2, 9 2	26888	25	EI 25	JWG
			Jun 27 22			16 0,16 4	58 25 7 N				EI 25	JWG
Miami, *B*	25 46 3 N	279 49	Jun 26, 22	10 4,13 1	1 34 3 E	14 4,14 5	58 23 9 N	11 1,12 1	26903	26	EI 26	WAL

SOUTH AMERICA

ARGENTINA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
La Quiaca, *1917*	22 06 6 S	294 25	Aug 5, '23	10 8,12 0	5 36 4 E	14 0,14 1	12 31 4 S	11 2,11 7	26483	25	EI 25	JWG
La Quiaca, *Magnetometer Pier*	22 06 6 S	294 25	Aug 4, 23	15 0,16 8	5 38 0 E			15 6,16 4	26434	25		JWG
			Aug 5, 23	8 6,10 1	5 38 4 E			9 0, 9 7	24647	25		JWG
			Aug 5, 23	15 1,16 4	5 39 4 E			15 5,16 1	26458	25		JWG
			Aug 6, 23			9 8,10 0	12 32 4 S				EI 25	JWG
			Aug 6, 23			10 6,10 8	12 31 6 S				EI 25	JWG
			Aug 6, 23			11 1 12 4	12 30 8 S				EI 25	JWG
			Jan 26, 26	9 6,11 0	5 20 8 E	11 4,11 7	12 27 0 S	10 0,10 7	26431	27	EI 27	JL
			Jan 27, 26	6 3 to 17 3 (dv)	5 21 6 E			6 3 to 17 3 (dv)	26299	27		JL
			Jan 28, 26			12 0,12 2	12 29 2 S				EI 27	JL
			Jan 28, 26			12 4	12 29 2 S				EI 27	JL
			Jan 30, 26			6 3 to 17 7 (dv)	12 32 5 S				EI 27	JL
La Quiaca, *B*	22 06 6 S	294 25	Aug 3, 23	13 6,15 5,15 9	5 36 4 E			14 1,15 0	26490	25		JWG
			Aug 3, 23					16 4	26456	25		JWG
			Aug 4, 23	10 4,10 8,14 2	5 38 2 E			9 7,11 3	26490	25		JWG
			Aug 4, 23					13 7	26477	25		JWG
La Quiaca, *C*	22 06 6 S	294 25	Jan 28, 26	14 3,15 7	5 18 7 E	16 6,16 9	12 33 3 S	14 7,15 4	26329	27	EI 27	JL
Tucumán	26 51 1 S	294 46	Aug 1, 23			17 4	19 30 8 S	16 2,16 9	25687	25	EI 25	JWG
Corrientes, *A*	27 28 7 S	301 10	Jul 2, 25	12 4,12 7	1 53 1 E	13 0,13 2	19 13 5 S	13 5,14 1	24680	27	EI 27	JL
			Jul 3, 25	9 7, 9 9	1 50 6 E	10 1,10 3	19 10 7 S	10 7,11 2	24708	27	EI 27	JL
Corrientes, *B*	27 28 7 S	301 10	Jul 3, 25	13 1,14 3	1 54 6 E	12 6,12 8	19 12 7 S	13 4,14 0	24688	27	EI 27	JL
Monte Caseros	30 15 4 S	302 22	Jun 30, 25	9 8,11 3	1 17 2 E	11 6,11 7	22 30 7 S	10 2,11 0	24174	27	EI 27	JL
Pilar, *B*	31 40 1 S	296 07	Jul 27, 23			12 3,12 7	25 39 0 S				EI 25	JWG
			Jul 27, 23			14 3,14 7	25 41 2 S				EI 25	JWG
			Jul 27, 23			15 3,15 9	25 42 4 S				EI 25	JWG
			Jul 27, 23			16 6	25 42 3 S				EI 25	JWG
			Jul 28, 23	10 4,12 9	7 22 9 E	8 0, 8 5	25 41 2 S	11 1,12 0	25117	25	EI 25	JWG
			Jul 28, 23	14 7,17 1	7 23 8 E			15 4,16 2	25114	25		JWG
			Jul 29, 23	8 9,11 3	7 22 8 E			9 6,10 4	25130	25		JWG
			Jan 15, 26	10 5,12 3	7 04 6 E			11 0,11 8	24962	27		JL
			Jan 18, 26	9 2,11 4	7 04 7 E			9 8,10 8	25007	27		JL
			Jan 18, 26	11 8,13 4	7 10 5 E			12 3,12 9	25016	27		JL
			Jan 20, 26			11 7,12 3	25 34 4 S				EI 27	JL
			Jan 20, 26			12 7,12 8	25 35 4 S				EI 27	JL
			Jan 21, 26			8 0, 8 2	25 48 2 S				EI 27	JL
Pilar, *Pier 2*	31 40 1 S	296 07	Jan 21, 26			11 2,11 5	25 40 0 S				EI 27	JL
			Jan 21, 26			11 8 11 9	25 39 4 S				EI 27	JL
			Jan 21, 26			12 2,12 5	25 38 4 S				EI 27	JL
Pilar, *Pier 5*	31 40 1 S	296 07	Jul 29, 23	12 1,15 3,15 8	7 23 3 E			12 8,14 6	25119	25		JWG
			Jul 29, 23					16 3	25126	25		JWG
			Jul 30 23	8 1, 9 7,12 3	7 23 2 E	16 3 to 17 0 (4)	25 38 9 S	8 8,10 6	25137	25	EI 25	JWG
			Jul 30, 23					11 4	25129	25		JWG
			Jul 31 23			7 9, 8 2	25 39 0 S				EI 25	JWG
			Jan 19, 26	7 4,10 5	7 01 9 E			8 0, 9 9	24947	27		JL
			Jan 19, 26	11 0,12 7	7 07 8 E			11 5,12 2	24972	27		JL
			Jan 20, 26	7 5,10 1	6 58 2 E			8 0, 9 5	24980	27		JL
Mendoza, *A*	32 53 6 S	291 08	Jan 7, 26	15 4,16 6	10 57 4 E	14 1,14 3	28 54 8 S	15 7,16 3	25430	27	EI 27	JL
			Jan 8, 26	6 3 to 17 5 (dv)	11 00 5 E			6 3 to 17 5 (dv)	25463	27		JL
			Jan 9, 26			6 6 to 17 5 (dv)	28 53 6 S				EI 27	JL
Mendoza, *B*	32 53 6 S	291 08	Jan 11, 26	8 9,10 3	10 59 0 E	10 9,11 2	28 51 6 S	9 3,10 0	25474	27	EI 27	JL
Florida, *B*	34 32 1 S	301 29	Jul 24, 23	12 0,13 6	4 08 2 E	11 4,11 5	28 07 8 S	12 4,13 2	24340	25	EI 25	JWG
Mercedes, *A*	34 40 3 S	300 33	Jun 22, 25	9 7, 9 9	4 34 3 E	10 1 10 3	28 23 2 S	10 6,11 2	24387	27	EI 27	JL
			Jun 23, 25	12 2,12 5	4 36 6 E	12 8,13 0	28 25 3 S	13 3,13 8	24345	27	EI 27	JL
Mercedes, *B*	34 40 3 S	300 33	Jun 23, 25	9 4,10 4	4 33 6 E	9 0, 9 2	28 28 2 S	9 6,10 2	24368	27	EI 27	JL
Bahia Blanca, *A*	38 46 7 S	297 44	Jun 13, 25	10 4,11 7	8 06 5 E	13 4,13 6	33 31 8 S	10 8,11 5	24732	27	EI 27	JL
			Jun 14, 25	7 3 to 16 4 (dv)	8 05 9 E			7 3 to 16 4 (dv)	24768	27		JL
			Jun 15, 25			7 5 to 16 4 (dv)	33 30 2 S				EI 27	JL
Bahia Blanca, *B*	38 46 7 S	297 44	Jun 16, 25	9 3,10 5	8 04 7 E	8 4, 8 7	33 30 4 S	9 6,10 2	24770	27	EI 27	JL
Puerto Madryn, *A*	42 45 2 S	294 58	May 27, 25	9 9,10 1	11 33 2 E	11 6,11 7	38 06 5 S	10 6,11 2	25326	27	EI 27	JL
			May 28, 25	13 2,13 4	11 37 8 E	13 8,14 0	38 09 3 S	15 2,15 7	25323	27	EI 27	JL
Puerto Madryn, *B*	42 45 2 S	294 58	May 29, 25	8 6, 9 9	11 39 2 E	10 3,10 6	38 11 9 S	8 9, 9 6	25326	27	EI 27	JL
Colonia Las Heras	46 33 1 S	291 03	May 19, 25	9 7,11 0	15 04 9 E	11 4,11 6	42 39 6 S	10 1,10 7	26112	27	EI 27	JL
Puerto Deseado, *A*	47 45 7 S	294 05	May 16, 25	10 6,11 9	13 41 4 E	8 5, 8 7	43 34 2 S	11 0,11 6	25884	27	EI 27	JL
			May 17, 25	7 7 to 16 6(dv)	13 42 0 E			7 7 to 16 6 (dv)	25895	27		JL

SOUTH AMERICA

ARGENTINA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Puerto Deseado, *A*—*Concluded*	47 45 7 S	294 05	May 22, '25			10 6,10 8	43 43 2S(?)				EI 27	JL
			May 23, 25			8 0 to 16 8 (dv)	43 34 5 S				EI 27	JL
Puerto Deseado, *B*	47 45 7 S	294 05	May 21, 25	10 5,11 8	13 41 1 E	12 5,12 8	43 38 5 S	10 8,11 5	25843	27	EI 27	JL
Santa Cruz, *A*	50 00 9 S	291 30	May 9 25	13 1,13 4	15 55 8 E	15 0,15 2	45 53 9 S	10 4,11 7	26380	27	EI 27	JL
			May 9, 25					13 9,14 5	26361	27		JL
			May 10, 25	8 2, 8 5	15 52 4 E	10 1,10 3	45 52 7 S	8 8, 9 5	26374	27	EI 27	JL
Santa Cruz, *B*	50 01 2 S	291 30	May 11, 25	9 8,11 1	15 51 9 E	8 8 9 0	45 54 2 S	10 1,10 8	26354	27	EI 27	JL
Rio Grande	53 48 1 S	292 22	Mar 26, 25	9 6 11 7	16 23 0 E	13 4 13 6	49 12 1 S	10 0,11 4	26436	27	EI 27	JL

BOLIVIA

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	H.I. LMT	H.I. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Guayaramerin [1]	10 48 1 S	294 41	Mar 10, '24	9 2,11 0	2 13 2 E	13 1,13 5	8 03 4 N	14 4,15 7	28408	28	EI 28	JTH
La Paz, *A*	16 30 8 S	291 47	Aug 13, 23	12 4,13 7	5 47 4 E	11 5,11 7	3 42 4 S	12 8,13 4	27960	25	EI 25	JWG
			Aug 13, 23	15 2,16 2	5 47 3 E			15 5,16 0	27894	25		JWG
			Aug 14, 23	8 6,10 3	5 46 8 E	8 9, 9 1	3 47 6 S			25	EI 25	JWG
			Dec 12, 24	10 4,11 5	5 40 4 E	12 2,12 4	3 37 4 S	10 7,11 3	27968	27	EI 27	JL
			Dec 16, 24			9 9 to 18 4 (dv)	3 39 5 S				EI 27	JL
La Paz, *B*	16 30 9 S	291 47	Aug 14, 23	12 8,14 1	5 48 6 E	12 4,12 6	3 45 0 S	13 1,13 8	27886	25	EI 25	JWG
Uyuni, *A*	20 28 0 S	293 11	Aug 9, 23	15 7,16 9	5 55 9 E	13 4,13 7	9 55 8 S	16 0,18 6	26900	25	EI 25	JWG
			Aug 10, 23	9 0,10 0	5 57 3 E	8 5, 8 6	9 58 3 S	11 5,12 1	26948	25	EI 25	JWG
			Aug 10, 23	11 0,12 4	5 55 5 E					25		JWG
Uyuni, *B*	20 28 0 S	293 11	Aug 10, 23	14 1,15 4	5 57 1 E	15 8,16 1	9 56 0 S	14 4,15 1	26909	25	EI 25	JWG

BRAZIL

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	H.I. LMT	H.I. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Papagaia Village	0 37 0 N	305 43	Nov 19, '23	13 3,	6 49 0 W			13 7	29328	28		JTH
			Nov 21, 23	10 1	6 46 5 W	16 0	27 34 7 N			28	EI 28	JTH
Pata	0 24 3 N	306 34	Dec 3, 23	10 4,12 9	7 35 2 W	15 7	26 30 4 N	10 8,13 3	29264	28	EI 28	JTH
Curumuri	0 16 0 N	306 07	Nov 26, 23	10 2	7 14 8 W			10 7	29406	28		JTH
Jawaré Pootoolé Island	0 01 9 N	307 03	Dec 7, 23	9 8,11 4	7 49 2 W	8 0	25 50 3 N	10 2,11 1	29274	28	EI 28	JTH
Touré Falls	0 01 6 N	306 15	Nov 12, 23	15 3 15 5	6 41 9 W	13 2	24 56 2 N			28	EI 28	JTH
Tapiocawa Rapids	0 10 4 S	306 19	Nov 7, 23	14 3	6 04 1 W	14 7	25 50 2 N			28	EI 28	JTH
Maguary Lighthouse	0 14 8 S	311 40	Aug 6, 23	10 7	11 01 0 W	13 2,13 4	24 35 0 N	11 1	29012	28	EI 28	JTH
Jawaré	0 16 0 S	306 18	Oct 29, 23	9 8 11 4	7 00 2 W	8 3	25 32 4 N	10 7	29272	28	EI 28	JTH
Santa Isabel	0 25 0 S	294 58	Feb 9, 24			13 3,13 9	26 38 4 N				EI 28	JTH
			Feb 10, 24	8 3 10 7	1 38 6 W			8 8,10 2	29956	28		JTH
			Feb 10, 24	10 9,12 4	1 37 0 W			11 3 12 0	29958	28		JTH
Miritipoco Island	0 27 7 S	306 27	Oct 26, 23	14 5	7 10 8 W	13 8	25 10 8 N	14 9	29381	28	EI 28	JTH
Takara Rapids	0 28 7 S	307 18	Dec 10, 23	10 6	7 52 3 W			11 1	29390	28		JTH
São Antonio de Cachoeira	0 39 9 S	307 31	Dec 12, 23			14 6,14 9	24 46 7 N				EI 28	JTH
			Dec 13, 23	10 0,13 5	8 05 0 W			10 4,11 4	29152	28		JTH
Souré	0 44 0 S	311 34	Aug 12, 23	10 1,11 8	10 39 6 W	8 0, 8 2	23 18 0 N	10 4,11 4	29198	28	EI 28	JTH
Maracanaquara Rapids	0 44 6 S	306 50	Oct 17, 23	13 3	6 20 5 W	8 1, 8 3	24 27 2 N	13 9,14 7	29419	28	EI 28	JTH
			Oct 20, 23	12 5	6 18 3 W					28		JTH
Muraeeka	0 57 4 S	306 52	Oct 12, 23	9 3,11 2	7 36 8 W	14 7	24 30 6 N	9 8,10 8	29290	28	EI 28	JTH
Barcellos, *A*	0 58 2 S	297 07	Feb 4, 24	11 3,13 9	1 02 4 W	9 2, 9 6	24 57 8 N	11 8,13 3	29862	28	EI 28	JTH
			Feb 4, 24	15 4,17 3	1 03 6 W			15 8,17 0	29822	28		JTH
Barcellos, *B*	0 58 2 S	297 07	Feb 5, 24	10 9 14 2	1 01 2 W	15 1,15 3	24 57 6 N	11 4,13 4	29858	28	EI 28	JTH
Panama Rapids	1 03 7 S	306 54	Oct 5, 23	15 4	7 41 5 W	14 5,14 7	24 26 6 N	16 0	28745	28	EI 28	JTH
			Oct 6, 23	7 6	7 36 3 W			8 0	28781	28		JTH
Porteiro Rapids	1 05 1 S	302 58	Aug 30, 23	10 1,14 4	4 44 8 W	8 2, 8 6	25 13 6 N	10 6,11 6	29258	28	EI 28	JTH
Pinheiro, *A*	1 17 9 S	311 31	Apr 18, 23	9 8,11 2	10 30 4 W	9 2, 9 4	22 33 8 N	10 1,10 8	29162	25	EI 25	JWG
			Apr 18, 23			13 7,14 1	22 31 2 N				EI 28	JTH
			Apr 18, 23			15 1,15 6	22 34 1 N				EI 28	JTH
			Apr 19, 23	6 4 to 17 4(dv)	10 33 7 W			6 6 to 17 4 (dv)	29121	25		JWG
			Jul 15, 23	15 8	10 34 6 W	10 8,11 1	22 31 4 N	16 2	29119	28	EI 28	JTH
Pinheiro, *B*	1 17 9 S	311 31	Apr 18, 23	9 6,12 3	10 31 7 W			10 1,11 0	29153	28		JTH
			Apr 18, 23	12 8,14 0	10 36 3 W	14 6,14 8	22 35 2 N	13 2,13 8	29156	25	EI 25	JWG
			Apr 19, 23			7 8 to 17 3 (dv)	22 31 7 N				EI 28	JTH
Veado	1 19 2 S	303 31	Sep 1, 23	9 6,11 3	5 22 2 W	7 8, 8 1	24 40 8 N	10 0,10 8	29378	28	EI 28	JTH

[1] Informed later that iron rails are buried near this spot, see Gujara Mirim, Brazil

SOUTH AMERICA

BRAZIL—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Almeirim	1 32 0 S	307 32	Oct 1, '23	10 2,13 1	7 49 6 W	8 3, 8 6	23 19 4 N	10 6,12 7	29192	28	EI 28	JTH
Oriximina	1 45 7 S	304 08	Aug 28, 23	10 1,11 8	5 39 4 W	8 6, 8 8	23 32 6 N	10 5,11 4	29316	28	EI 28	JTH
Obidos, *A*	1 55 0 S	304 32	Aug 26, 23	10 5,13 8	5 44 4 W	16 2,16 5	23 08 5 N	11 1 14 3	29296	28	EI 28	JTH
Obidos, *B*	1 55 0 S	304 32	Sep 5, 23	12 8,14 7	5 49 0 W	10 9,11 2	23 11 1 N	13 3,14 2	29258	28	EI 28	JTH
Santarem, *A*	2 24 9 S	305 21	Sep 8, 23	14 0,17 3	6 13 8 W	13 0,13 3	22 19 2 N	14 5,16 6	29134	28	EI 28	JTH
			Sep 10, 23	10 4,14 0	6 15 6 W	9 0, 9 2	22 21 0 N	10 8,11 8	29170	28	EI 28	JTH
			Sep 14, 23	7 6 to 17 6(dv)	6 14 9 W					28		JTH
Santarem *B*	2 25 0 S	305 21	Sep 11, 23	10 2,11 8	6 14 9 W	8 4, 8 6	22 20 1 N	10 6,11 5	29182	28	EI 28	JTH
San Luis, *A*	2 30 3 S	315 43	May 3, 23	10 0,11 4	13 07 4 W	11 7,11 9	18 33 0 N	10 4,11 0	28926	25	EI 25	JWG
			May 4, 23	14 5,15 7	13 09 6 W	9 5,16 0	18 32 2 N	14 8,15 4	28904	25	EI 25	JWG
San Luis, *B*	2 30 3 S	315 43	May 3, 23	15 2,16 4	13 09 2 W	14 4,14 6	18 32 5 N	15 5,16 1	28876	25	EI 25	JWG
San Luis, *Campo do Durique*	2 31 4 S	315 43	May 2, 23	9 8,11 3	13 06 4 W	13 7,13 9	18 25 6 N	10 2,11 0	28954	25	EI 25	JWG
Bocca do Jutahy	2 42 S	293 10	Apr 17, 24	7 2, 8 4	1 14 2 E	7 6	20 35 9 N	8 0	29967	28	EI 28	JTH
Victoria (Rio Xingu)	2 53 5 S	308 00	Jul 9, 23	12 9,14 9	8 07 0 W	16 4,16 7	21 24 8 N	13 4,14 3	28918	28	EI 28	JTH
Cachoeira Tucuruhy	3 01 S	307 45	May 16, 23	10 6	8 01 9 W	8 3, 8 6	20 57 6 N			28	EI 28	JTH
Manaos, *B*	3 07 6 S	299 58	Mar 1, 24	8 5,10 9	2 27 6 W	11 8	21 33 1 N	9 0,10 6	29496	28	EI 28	JTH
			Apr 10, 24			9 7,10 0	21 33 3 N				EI 28	JTH
Manaos, *A*	3 08 5 S	300 00	Jan 24, 24	10 2,12 5	2 25 8 W	13 3,13 6	21 31 0 N	10 6,12 1	29474	28	EI 28	JTH
			Jan 26, 24	7 4,17 6	2 28 4 W			7 8 to 17 9 (dv)	29453	28		JTH
			Jan 26, 24	7 8 to 17 9(dv)	2 28 0 W					28		JTH
			Feb 19, 24	9 6,12 0	2 28 0 W	13 0,13 4	21 30 3 N	10 1,11 0	29470	28	EI 28	JTH
			Feb 21, 24			8 2 to 16 8 (dv)	21 33 0 N				EI 28	JTH
Alta Mira	3 12 5 S	307 48	May 18, 23	13 3,15 2	8 00 0 W	11 0,11 2	21 15 0 N	13 8,14 7	28904	28	EI 28	JTH
São Paulo de Olivença	3 31 S	290 59	Apr 19, 24	6 8	2 55 6 E			7 1	30405	28		JTH
Alcobaça	3 45 2 S	310 19	Apr 22, 23	14 6,16 0	9 28 4 W	13 1,13 3	18 44 4 N	15 0 15 6	28666	25	EI 25	JWG
			Apr 23, 23	9 6,11 1	9 24 4 W	8 2, 8 4	18 47 8 N	10 0,10 7	28709	25	EI 25	JWG
Jatoba	4 51 6 S	307 13	May 24, 23	10 0,11 8	6 38 0 W	13 6,14 8	18 30 8 N	10 4,11 3	28827	28	EI 28	JTH
São Sebastião	5 48 S	307 24	Jun 30, 23			16 8,17 0	15 49 0 N				EI 28	JTH
			Jul 1, 23	9 1	7 03 6 W			10 8	28555	28		JTH
			Jul 2, 23	7 8, 9 1	7 02 5 W			8 2	28539	28		JTH
São Felix	6 38 8 S	308 01	May 30, 23	9 6,14 4	7 22 7 W	8 1, 8 3	14 15 4 N	10 1,11 2	28390	28	EI 28	JTH
			Jun 1, 23	6 9 to 16 7(dv)	7 20 7 W					28		JTH
Estreeto	6 59 1 S	308 17	Jun 8, 23	10 4,13 5	7 25 2 W	9 0, 9 3	14 23 1 N	11 0,15 0	28319	28	EI 28	JTH
Capivara Cachoeira	7 24 3 S	308 46	Jun 18, 23	10 5	7 46 8 W	11 2	12 40 N			28	EI 28	JTH
Novo Horizonte	7 43 6 S	308 49	Jun 14, 23	11 1,12 9	7 56 4 W	8 8, 9 1	12 12 2 N	14 0,15 0	28034	28	EI 28	JTH
			Jun 15, 23	6 8 to 17 2(dv)	7 57 4 W					28		JTH
Pernambuco, *B*	8 03 6 S	325 07	May 11, 23	16 2,17 5	18 05 1 W	10 0,10 2	1 08 8 N	16 5,17 1	27704	25	EI 25	JWG
Pernambuco, *A*	8 03 7 S	325 06	May 12, 23	9 7,11 0	18 02 6 W	11 5,11 7	1 06 6 N	10 0,10 7	27750	25	EI 25	JWG
			May 12, 23	14 7,16 0	18 03 6 W	16 3,16 5	1 11 5 N	15 0,15 7	27700	25	EI 25	JWG
Porto Velho, *A*	8 45 6 S	296 05	Mar 14, 24	13 7,15 5	1 00 5 E	11 4,13 0	11 41 8 N	14 1 15 1	29006	28	EI 28	JTH
			Mar 15, 24	8 8,10 7	0 57 3 E	14 0	11 40 8 N	9 3,10 2	29016	28	EI 28	JTH
			Mar 20 24	7 7	0 57 0 E			7 9 to 16 8 (dv)	29002	28		JTH
			Mar 20, 24	7 9 to 16 8(dv)	0 59 6 E					28		JTH
Porto Velho, *B*	8 45 6 S	296 05	Mar 15, 24			16 6,17 0	11 39 9 N				EI 28	JTH
			Mar 16 24	9 1,11 4	0 58 6 E			9 6,10 9	29082	28		JTH
Joazeiro, *A*	9 24 1 S	319 29	May 25, 23	15 1 15 4 16 6	14 54 0 W	13 9,14 2	3 13 4 N	15 7,16 3	26858	25	EI 25	JWG
			May 26, 23	9 7,10 0	14 53 4 W	8 3, 8 6	3 17 8 N	10 4,11 1	26864	25	EI 25	JWG
Joazeiro, *B*	9 24 1 S	319 29	May 26, 23	13 3,14 6	14 57 8 W	15 5,15 7	3 13 0 N	13 6,14 3	26946	25	EI 25	JWG
Guajara Mirim	10 49 S	294 41	Mar 9, 24	10 2,15 4	2 32 2 E			10 7,12 8	28752	28		JTH
			Mar 11, 24			7 5,17 0	7 30 5 N				EI 28	JTH
			Mar 11, 24			8 0 to 16 6 (dv)	7 28 3 N				EI 28	JTH
Aracaju	10 54 0 S	322 55	May 31, 23	10 1,11 6	16 58 9 W	14 2,14 4	1 21 8 S	10 5,11 2	27096	25	EI 25	JWG
			Jun 1, 23	6 8 to 17 8(dv)	16 58 4 W					25		JWG
Bahia, *A*	13 00 5 S	321 29	May 18, 23	13 2,14 6	16 02 6 W	11 6,11 7	3 46 2 S	13 6,14 3	25994	25	EI 25	JWG
			May 19, 23			7 9 to 17 8 (dv)	3 48 1 S				EI 25	JWG
			May 20, 23	6 6 to 17 7(dv)	16 04 8 W			6 6 to 17 7 (dv)	26030	25		JWG
Bahia, *B*	13 00 5 S	321 29	May 21, 23	10 0,11 8	15 50 8 W	9 4, 9 6	3 57 6 S	10 4,11 4	25933	25	EI 25	JWG
Colonia Corazon Jesus	15 33 4 S	307 02	Sep 24, 25	9 0,10 3	5 57 6 W	8 1, 8 4	1 15 1 S	9 4,10 0	26642	27	EI 27	JL
Cuyaba, *A*	15 35 8 S	303 54	Aug 21, 25	9 6,11 2	3 35 6 W	11 5,11 7	0 39 3 S	10 1,10 8	26936	27	EI 27	JL
			Aug 22, 25	7 0 to 17 7(dv)	3 34 9 W			7 0 to 17 7 (dv)	26921	27		JL
			Aug 24, 25	7 2 to 17 7(dv)	3 35 0 W			7 2 to 17 7 (dv)	26908	27		JL
			Aug 26, 25			7 4 to 17 6 (dv)	0 39 6 S				EI 27	JL
			Aug 27, 25			7 5 to 17 6 (dv)	0 39 4 S				EI 27	JL

SOUTH AMERICA

BRAZIL—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Cuyaba, *B*	15 35 8 S	303 54	Aug 25, '25	7 9, 9 1	3 33 3 W	9 3, 9 5	0 41 4 S	8 2, 8 8	26895	27	EI 27	JL
Cuyaba, *C*	15 35 8 S	303 54	Sep 2, 25	8 7,10 2	3 34 2 W	11 2,11 6	0 39 3 S	9 1, 9 8	26916	27	EI 27	JL
Presidente Murtinho	15 39 1 S	306 06	Sep 18, 25	9 0,10 9	5 08 2 W	7 6, 7 9	1 06 2 S	9 5,10 5	26780	27	EI 27	JL
Rio Manso	15 40 2 S	304 44	Sep 9, 25	14 9,16 5	4 02 6 W			15 3,16 1	26794	27		JL
			Sep 10, 25			8 0, 8 3	0 57 8 S				EI 27	JL
Registro	15 43 1 S	308 13	Oct 2, 25	8 1, 9 4	5 04 9 W	10 6,10 9	0 34 7 N	8 4 9 1	26180	27	EI 27	JL
Serredina	15 53 5 S	308 59	Oct 8, 25	7 6, 8 8	7 28 2 W	7 0, 7 2	2 10 4 S	7 9, 8 6	26444	27	EI 27	JL
Goyaz, *B*	15 56 4 S	309 51	Oct 17, 25	10 9,12 7	7 57 8 W	10 1,10 4	2 42 8 S	11 2,12 4	26336	27	EI 27	JL
Goyaz, *A*	15 56 6 S	309 52	Oct 15, 25	7 9, 9 3	8 04 4 W	10 8,11 1	2 40 2 S	8 3, 9 0	26350	27	EI 27	JL
			Oct 16, 25	5 9 to 17 0(dv)	8 02 5 W			5 9 to 17 0 (dv)	26365	27		JL
			Oct 18, 25			6 7 to 17 9 (dv)	2 45 6 S				EI 27	JL
Bella Vista	16 59 4 S	311 05	Oct 23, 25	7 5, 9 1	8 55 0 W	10 6,11 0	5 07 2 S	7 9, 8 8	25886	27	EI 27	JL
Caravellas, *B*	17 44 2 S	320 47	Jun 12, 23	10 0,11 5	15 13 4 W	13 8,14 0	11 30 0 S	10 4,11 1	25200	25	EI 25	JWG
Caravellas, *A*	17 44 4 S	320 47	Jun 11, 23	10 8,12 7	15 13 2 W	10 2,10 3	11 31 8 S	11 7,12 3	25196	25	EI 25	JWG
			Jun 11, 23	15 0,15 3	15 11 5 W	14 4,15 6	11 33 7 S	16 2,16 9	25164	25	EI 25	JWG
			Jun 12, 23	8 3, 8 6	15 13 4 W					25		JWG
Catalão, *A*	18 10 8 S	312 07	Oct 27, 25	8 9, 9 1	9 54 6 W	9 7,10 0	7 17 1 S	7 9, 8 6	25438	27	EI 27	JL
			Oct 28, 25	14 1,14 3	9 49 2 W	12 4,12 7	7 14 0 S	13 2,13 7	25473	27	EI 27	JL
Catalão, *B*	18 10 8 S	312 05	Oct 28, 25	7 6, 8 9	9 56 2 W	9 5, 9 8	7 15 6 S	8 0, 8 6	25418	27	EI 27	JL
Corumba, *D*	19 00 1 S	302 21	Aug 6, 25	10 4,10 6	1 41 1 W	12 2,12 4	6 24 0 S	10 9,11 6	26182	27	EI 27	JL
			Aug 6, 25	13 4,13 6	1 38 8 W	15 9,16 2	6 24 6 S	14 3 14 9	26168	27	EI 27	JL
Corumba, *E*	19 00 1 S	302 21	Aug 8, 25	8 8,10 2	1 34 4 W	10 6,10 9	6 26 5 S	9 2, 9 8	26157	27	EI 27	JL
Uberaba	19 45 4 S	312 05	Nov 1, 25	7 8, 9 3	9 55 6 W	9 6, 9 9	10 03 4 S	8 2, 9 0	25002	27	EI 27	JL
Victoria, *A**	20 19 9 S	319 40	Jun 22, 23	9 9,11 4	14 16 4 W	11 6,11 8	16 01 5 S	10 3,10 9	24396	25	EI 25	JWG
			Jun 23, 23	8 8,12 3,13 7	14 16 4 W	9 4,14 1	16 04 0 S	12 7,13 4	24388	25	EI 25	JWG
			Jun 23, 23	15 5,16 7	14 18 3 W			15 8,16 4	24379	25		JWG
Victoria, *D**	20 19 9 S	319 40	Jun 23, 23	10 4	14 45 5 W					25		JWG
Victoria, *B**	20 20 0 S	319 40	Jun 21, 23	12 5,13 9	13 45 9 W	10 8,11 0	15 45 0 S	12 9,13 6	24536	25	EI 25	JWG
Victoria, *E**	20 20 0 S	319 40	Jun 23, 23	10 7	15 01 3 W					25		JWG
Victoria, *C**	20 20 1 S	319 40	Jun 21, 23	15 3	15 53 8 W					25		JWG
			Jun 22, 23	13 1,14 5	15 52 1 W	15 1,15 3	16 26 2 S	13 4,14 1	24902	25	EI 25	JWG
Vassouras, *A*	22 24 0 S	316 21	Jul 1, 23	14 9,16 5	11 44 4 W			15 3,16 0	24322	25		JWG
			Jul 2, 23	9 1,10 8	11 42 0 W			9 6,10 4	24322	25		JWG
			Jul 2, 23	11 2,13 4	11 44 7 W			11 6,13 0	24324	25		JWG
			Nov 11, 25	10 4,11 9	12 01 6 W			10 7,11 5	24252	27		JL
			Nov 11, 25	13 4,15 2	12 02 4 W			13 9,14 4	24237	27		JL
			Nov 11, 25	15 6,17 3	12 04 8 W			16 1,16 9	24224	27		JL
			Nov 12, 25			10 5,11 5	16 25 0 S				EI 27	JL
			Nov 12, 25			12 0,12 3	16 25 0 S				EI 27	JL
			Nov 12, 25			13 4,13 8	16 26 0 S				EI 27	JL
			Nov 14, 25	14 3,14 6	12 06 4 W					27		JL
			Nov 14, 25	14 8,15 1	12 06 2 W					27		JL
			Nov 14, 25	15 4,15 6	12 05 2 W					27		JL
			Nov 16, 25			8 9, 9 2	16 23 9 S				EI 27	JL
			Nov 16, 25			9 7,10 0	16 22 9 S				EI 27	JL
			Nov 16, 25			10 4,10 8	16 23 0 S				EI 27	JL
Vassouras, *B*	22 24 0 S	316 21	Jun 30, 23	11 2,12 6	11 43 6 W			13 2,14 0	24294	25		JWG
			Jun 30, 23	14 6,16 3	11 45 0 W			15 0,15 8	24274	25		JWG
			Jul 1, 23	9 0,10 8	11 43 6 W	11 5,11 9	15 54 4 S	9 5,10 3	24336	25	EI 27	JWG
			Jul 1, 23			13 1,13 4	15 54 8 S				EI 27	JWG
			Jul 1, 23			13 8,14 1	15 55 2 S				EI 27	JWG
			Nov 9, 25	14 0,15 9	12 02 6 W			14 5,15 5	24192	25		JL
			Nov 10, 25	10 0,12 1	12 01 4 W			10 4,11 7	24265	25		JL
			Nov 10, 25	13 4,14 9	12 02 1 W			13 8,14 6	24206	25		JL
			Nov 14, 25	16 0,16 2,16 4	12 05 7 W					27		JL
			Nov 14, 25	16 6,16 8,17 0	12 04 4 W					27		JL
Vassouras, *C*	22 24 0 S	316 21	Jul 2, 23			14 1,14 4	15 56 8 S				EI 25	JWG
			Jul 2, 23			14 8,15 0	15 56 4 S				EI 25	JWG
			Jul 2, 23			15 4,15 7	15 57 2 S				EI 25	JWG
			Nov 12, 25			14 4,14 9	16 24 6 S				EI 27	JL
			Nov 12, 25			15 9	16 23 9 S				EI 27	JL
			Nov 16, 25			11 6,12 0	16 22 5 S				EI 27	JL
			Nov 16, 25			13 0,13 4	16 23 8 S				EI 27	JL
			Nov 16, 25			13 8,14 2	16 23 8 S				EI 27	JL
Santos, *A*	23 57 5 S	313 36	Jul 9, 23	15 3,16 6	9 37 4 W	13 9,14 1	16 48 0 S	15 6,16 3	24119	25	EI 25	JWG
			Jul 10, 23	8 9, 9 8	9 34 8 W	10 4,10 6	16 50 1 S	11 5,12 2	24132	25	EI 25	JWG
			Jul 10, 23	11 0,12 5	9 35 6 W					25		JWG
			Nov 24, 25	9 1, 9 3	10 01 6 W	9 6, 9 8	17 07 6 S	7 8, 8 7	24052	27	EI 27	JL
			Nov 25, 25	12 4,12 6	9 56 5 W	11 9,12 1	17 10 0 S	13 0,13 7	24076	27	EI 27	JL
Santos, *B*	23 57 5 S	313 36	Jul 9, 23	10 2,11 5	9 39 4 W	12 5,12 7	16 54 2 S	10 5,11 2	24121	25	EI 25	JWG

*Local disturbance

SOUTH AMERICA

BRAZIL—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Santos, *B—Concluded*	23 57 5 S	313 36	Nov 24, '25	11 9,13 1	10 00 8 W	11 4,11 6	17 16 1 S	12 2,12 8	24099	27	EI 27	JL
Porto Alegre, *A*	30 02 0 S	308 46	Dec 4, 25	12 7,14 3	4 10 3 W	11 4,11 6	23 36 9 S	13 2,13 9	23744	27	EI 27	JL
			Dec 5, 25	6 1 to 17 6 (dv)	4 13 2 W			6 1 to 17 6 (dv)	23721	27		JL
			Dec 8, 25			6 1 to 17 4 (dv)	23 38 6 S				EI 27	JL
Porto Alegre, *B*	30 02 0 S	308 46	Dec 7, 25	10 2 11 4	4 11 7 W	11 8,12 1	23 38 2 S	10 6,11 1	23718	27	EI 27	JL
Rio Grande, *A*	32 01 5 S	307 52	Dec 12, 25	15 4,16 8	2 45 4 W	14 9,15 2	26 03 0 S	15 8,16 5	23444	27	EI 27	JL
			Dec 13, 25	10 5,11 9	2 45 6 W	9 9,10 1	26 05 3 S	10 8,11 5	23450	27	EI 27	JL
Rio Grande, *B*	32 01 5 S	307 52	Dec 13, 25	7 1, 8 4	2 46 8 W	8 9, 9 1	26 08 3 S	7 4, 8 0	23404	27	EI 27	JL

CHILE

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Arica, *A*	18 28 6 S	289 40	Dec 21, '24	8 0, 9 2	6 46 6 E	7 6, 7 8	8 04 1 S	8 3, 8 9	27892	27	EI 27	JL
			Dec 21 24	10 2,11 5	6 48 2 E	13 2,13 4	8 00 0 S	10 5,11 2	27922	27	EI 27	JL
Arica, *B*	18 28 6 S	289 40	Dec 20, 24	13 0,14 4	6 48 4 E	10 9,11 1	8 00 6 S	13 3,14 0	27927	27	EI 27	JL
Iquique	20 12 7 S	289 50	Dec 24, 24	9 7,11 0	7 55 6 E	11 4,11 5	10 48 1 S	10 1,10 7	27319	27	EI 27	JL
Calama	22 28 3 S	291 03	Jan 4, 25	10 0,11 1	7 38 8 E	11 5,11 7	13 58 4 S	10 3,10 8	26800	27	EI 27	JL
Antofagasta, *A*	23 38 8 S	289 38	Dec 27, 24	10 0,11 6	8 38 8 E	13 2,13 3	16 54 9 S	10 5,11 2	26774	27	EI 27	JL
			Dec 29, 24	6 4 to 17 6 (dv)	8 36 7 E			6 4 to 17 6 (dv)	26756	27		JL
			Jan 2, 25			6 7 to 17 9 (dv)	16 51 2 S				EI 27	JL
Antofagasta, *B*	23 38 8 S	289 38	Dec 30, 24	9 8,11 1	8 22 0 E	11 4,11 6	16 52 3 S	10 2,10 8	26784	27	EI 27	JL
Copiapo, *A*	27 22 0 S	289 43	Jan 11, 25	17 3,17 5	9 35 0 E	17 9,18 1	22 24 4 S	16 3,17 0	26238	27	EI 27	JL
			Jan 12, 25	9 6, 9 9	9 35 0 E	12 6,12 8	22 16 6 S	10 2,11 4	26303	27	EI 27	JL
Copiapo, *B*	27 22 0 S	289 43	Jan 13, 25	9 8,11 5	9 33 3 E	12 0,12 1	22 17 7 S	10 3,11 1	26283	27	EI 27	JL
Coquimbo, *A*	29 57 8 S	288 40	Jan 19, 25	16 5,16 8	10 45 1 E	17 3,17 5	26 02 8 S	15 4,16 1	26034	27	EI 27	JL
			Jan 20, 25	10 3,10 6	10 44 5 E	12 7,12 8	25 55 1 S	11 0,11 6	26155	27	EI 27	JL
Coquimbo, *B*	29 57 8 S	288 40	Jan 21, 25	10 7,11 8	10 41 8 E	10 3,10 5	25 50 0 S	11 0,11 5	26162	27	EI 27	JL
Valparaiso, *A*	33 04 4 S	288 25	Jan 29, 25	10 0,11 6	12 51 6 E	12 7,12 8	30 03 8 S	10 5,11 2	25811	27	EI 27	JL
			Jan 30, 25	6 4 to 17 2 (dv)	12 50 5 E			6 4 to 17 2 (dv)	25780	27		JL
			Feb 2, 25			6 7 to 17 2 (dv)	30 07 1 S				EI 27	JL
Valparaiso, *B*	33 04 4 S	288 25	Jan 31 25	9 5,10 8	12 41 2 E	11 2,11 4	29 39 2 S	9 9,10 5	25870	27	EI 27	JL
Coronel, *A*	37 01 9 S	286 51	Feb 8, 25	11 1,11 3	14 55 5 E	10 7,10 9	34 57 4 S	11 6,12 1	26024	27	EI 27	JL
			Feb 8, 25	15 6,15 8	14 55 2 E	15 4,15 6	35 01 5 S	16 3,16 9	26000	27	EI 27	JL
Coronel, *B*	37 01 9 S	286 51	Feb 9, 25	10 6,11 7	15 00 0 E	10 3,10 5	34 55 8 S	10 9,11 4	25998	27	EI 27	JL
Corral	39 53 7 S	286 29	Feb 11, 25	11 4,13 1	15 22 3 E	13 8,14 0	38 02 0 S	11 7,12 8	26426	27	EI 27	JL
Puerto Montt, *A*	41 29 3 S	287 04	Feb 13, 25	10 7,11 9	15 35 2 E	13 4,13 5	39 55 8 S	11 0,11 6	26213	27	EI 27	JL
			Feb 14, 25	6 3 to 16 4 (dv)	15 35 3 E			6 3 to 17 4 (dv)	26220	27		JL
			Feb 16, 25			7 6 to 18 1 (dv)	39 58 0 S				EI 27	JL
Puerto Montt, *B*	41 29 3 S	287 04	Feb 13, 25	15 3,16 3	15 36 2 E	14 8,15 0	39 55 3 S	15 5,16 0	26224	27	EI 27	JL
Ultima Esperanza, *A**	51 41 1 S	287 31	Mar 10, 25	12 5,12 6	18 44 4 E	11 6,11 8	48 24 3 S	17 7,18 3	26741	27	EI 27	JL
			Mar 10, 25	18 6	18 48 7 E	17 3,17 5	48 24 4 S			27	EI 27	JL
			Mar 11, 25					10 7,11 3	26723	27		JL
Ultima Esperanza, *B**	51 41 1 S	287 31	Mar 10, 25	15 8 16 9	19 34 8 E			16 1,16 6	26832	27		JL
			Mar 11, 25			15 0,15 2	48 02 4 S				EI 27	JL
Punta Arenas, *C*	53 09 8 S	289 10	Mar 20, 25	10 2,11 7	18 14 4 E	12 8,13 2	49 22 6 S	10 6,11 3	26622	27	EI 27	JL
Punta Arenas, *A*	53 10 4 S	289 08	Feb 28, 25	9 8,12 0	18 10 3 E	12 6,12 8	49 26 2 S	10 9,11 7	26614	27	EI 27	JL
			Mar 2, 25	6 2 to 17 2 (dv)	18 11 8 E			6 2 to 17 2 (dv)	26633	27		JL
			Mar 5, 25			7 2 to 17 9 (dv)	49 27 6 S				EI 27	JL
			Mar 22, 25	6 5 to 17 9 (dv)	18 10 9 E			6 5 to 17 9 (dv)	26631	27		JL
Punta Arenas, *B*	53 10 4 S	289 08	Mar 6, 25	10 5,11 8	18 12 0 E	10 3,10 4	49 26 0 S	10 8,11 4	26613	27	EI 27	JL

COLOMBIA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Cartagena	10 25 8 N	284 27	Nov 7, '22	10 0,12 1	3 07 6 E	13 0,13 5	40 25 2 N	10 7,11 7	31064	26	EI 26	WAL
Calamar	10 15 4 N	285 07	Nov 23, 22	12 4,14 1	2 50 0 E	9 9,10 2	39 46 0 N	12 9,13 7	31035	26	EI 26	WAL
			Nov 23, 22			15 3,15 7	39 46 6 N				EI 26	WAL
			Nov 24, 22	6 3, 7 8	2 50 8 E			6 7, 7 5	31011	26		WAL

* Local disturbance

SOUTH AMERICA

COLOMBIA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
La Playona	8 25 6 N	282 46	Nov 14, '22	12 6,14 5	5 16 8 E	15 4,15 8	36 05 4 N	13 1,14 0	31550	26	EI 26	WAL
			Nov 15, 22	6 6 to 16 8 (dv)	5 16 1 E					26		WAL
Barranca Bermeja	7 04 6 N	286 09	Nov 29, 22	13 3,15 4	3 02 4 E			13 7,14 9	31190	26		WAL
			Nov 30, 22	7 4, 9 4	3 05 3 E	10 0,10 2	35 19 4 N	7 8, 8 9	31206	26	EI 26	WAL
			Nov 30, 22			13 3,13 6	35 17 6 N				EI 26	WAL
Infantas	6 51 7 N	286 15	Dec 2 22	13 4 15 5	2 53 8 E	16 4,16 6	34 59 6 N	14 0,15 0	31224	26	EI 26	WAL
Puerto Berrio	6 29 0 N	285 36	Dec 7, 22	9 6,11 3	3 29 8 E	12 4,12 6	34 09 0 N	10 0,10 4	31352	26	EI 26	WAL
Medellin	6 14 6 N	284 25	Dec 11, 22	9 7,11 4	3 52 2 E	12 6,12 8	33 12 9 N	10 1,11 0	31660	26	EI 26	WAL
Honda	5 13 1 N	285 18	Dec 18, 22	9 8,11 5	4 06 8 E	12 8,13 0	32 08 7 N	10 2,11 2	31332	26	EI 26	WAL
Bogota, *A*	4 37 6 N	285 54	Dec 23 22	12 6,14 5	3 41 0 E	11 6,11 8	31 06 0 N	13 2,13 6	31364	26	EI 26	WAL
			Dec 24, 22			7 6 to 17 1 (dv)	31 02 6 N				EI 26	WAL
			Dec 25, 22	7 9 to 16 9(dv)	3 42 4 E			8 1 to 16 8 (dv)	31384	26		WAL
Bogota, *B*	4 37 6 N	285 54	Dec 26, 22	9 4,11 1	3 41 9 E	12 8,13 1	31 05 6 N	9 8,10 7	31368	26	EI 26	WAL
Buenaventura	3 54 1 N	282 55	Jan 14, 23	10 4,11 7	4 55 0 E	13 5,13 7	28 48 5 N	10 8,11 4	31814	26	EI 26	WAL
Cali	3 26 6 N	283 26	Jan 11, 23	12 0,14 4	5 06 2 E	11 4,11 6	28 34 2 N	13 4,14 1	31730	26	EI 26	WAL

ECUADOR

Station	Latitude	Long East of Gr	Date	Decl. Local Mean Time	Decl. Value	Incl. L M T	Incl. Value	Hor Int. L M T	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Quito, *A**	0 13 1 S	281 29	Oct 1, '24	10 8 12 9	6 29 3 E			11 2,12 1	31878	28		JTH
			Mar 13, 26	10 6,11 6	6 31 1 E	10 1,10 3	22 08 7 N	10 8,11 3	31842	27	EI 27	JL
Quito, *B**	0 13 1 S	281 28	Sep 26, 24	12 5,14 4	6 18 0 E			13 0,13 9	32313	28		JTH
			Sep 30, 24	8 7 to 16 8(dv)	6 13 9 E			8 7 to 16 8 (dv)	32296	28		JTH
			Sep 30, 24	9 5,16 6	6 18 1 E					28		JTH
			Mar 10, 26	15 8,17 0	6 20 2 E	15 0,15 2	21 05 6 N	16 1,16 6	32161	27	EI 27	JL
			Mar 11, 26	6 3 to 17 3(dv)	6 21 2 E			6 3 to 17 3 (dv)	32173	27		JL
			Mar 12, 26			6 3 to 17 0 (dv)	21 04 5 N				EI 27	JL
Riobamba, *A**	1 39 5 S	281 18	Sep 17, 24	11 5,13 7	6 42 4 E			12 2,13 2	33355	28		JTH
			Sep 18, 24	10 7,14 0	6 42 6 E			11 1,13 6	33350	28		JTH
Riobamba, *B**	1 39 8 S	281 19	Sep 20, 24	10 4,12 4	6 34 0 E			11 0,12 0	31796	28		JTH
Riobamba, *C**	1 39 8 S	281 19	Sep 20, 24	16 1	6 40 5 E			16 5	31649	28		JTH
Guayaquil	2 10 8 S	280 09	Sep 10, 24	9 9,11 6	7 07 5 E			10 3,11 3	31812	28		JTH
			Mar 7, 26	9 8,11 2	7 11 6 E	9 4, 9 5	17 46 6 N	10 3,11 0	31790	27	FI 27	JL

GUIANA

Station	Latitude	Long East of Gr	Date	Decl. Local Mean Time	Decl. Value	Incl. L M T	Incl. Value	Hor Int. L M T	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Georgetown, *A*	6 48 6 N	301 51	Mar 6, '23	13 6,15 5	5 27 0 W			14 0,15 0	29538	28		JTH
			Mar 7, 23	9 2,11 0	5 24 7 W	11 8,12 0	36 41 3 N	9 7,10 6	29528	28	EI 28	JTH
			Mar 7, 23			17 0,17 3	36 43 2 N				EI 28	JTH
Georgetown, *B*	6 48 0 N	301 51	Mar 7, 23	10 3,11 5	5 23 8 W	13 5,13 7	36 40 6 N	10 6,11 2	29555	25	EI 25	JWG
Bartica	6 23 8 N	301 25	Mar 9, 23	10 7,12 6	5 04 9 W	8 8, 9 2	36 35 4 N	11 2,13 0	29436	28	EI 28	JTH
New Amsterdam	6 16 3 N	302 29	Mar 9, 23	15 3,16 7	5 48 4 W	14 1,14 3	36 20 0 N	15 6,16 4	29377	25	EI 25	JWG
Paramaribo, *C*	5 50 0 N	304 51	Mar 17, 23			17 2,17 5	35 32 1 N				EI 28	JTH
			Mar 19, 23			7 2 to 18 0 (dv)	35 32 4 N				EI 28	JTH
			Mar 20, 23	10 3,12 1	6 58 4 W			10 8,11 7	29279	28		JTH
Paramaribo, *A*	5 50 0 N	304 51	Mar 17, 23			16 7,16 9	35 32 0 N				EI 25	JWG
			Mar 19, 23	7 0 to 18 0(dv)	6 58 9 W			7 2 to 18 0 (dv)	29289	25		JWG
			Mar 20, 23	9 8,11 2	6 58 0 W			10 2,10 8	29308	25		JWG
Onverwacht	5 34 6 N	304 50	Mar 21, 23	11 1,12 9	7 08 2 W	14 2,14 5	35 29 0 N	11 5,12 4	29242	28	EI 28	JTH
Saint Laurent, *A*	5 29 4 N	305 59	Mar 30, 23	9 [illegible],11 3	8 03 6 W	13 7,13 9	34 35 8 N	10 1,10 9	29514	25	EI 25	JWG
			Mar 31, 23	6 8 to 18 1(dv)	8 06 5 W			6 9 to 18 1 (dv)	29499	25		JWG
Saint Laurent, *B*	5 29 4 N	305 59	Mar 30, 23	9 8,11 6	8 03 8 W	14 1,14 4	34 34 6 N	10 4,11 3	29531	28	EI 28	JTH
			Mar 31, 23	7 1 to 17 6(dv)	8 06 3 W					28		JTH
Cayenne, *A**	4 56 1 N	307 40	Apr 9, 23	14 4,15 8	9 16 0 W	16 2,16 4	34 14 7 N	14 8,15 4	29285	25	EI 25	JWG
			Apr 10, 23	9 3,10 6	9 13 2 W	11 4,11 6	34 09 0 N	9 6,10 2	29294	25	EI 25	JWG
Cayenne, *B*	4 56 1 N	307 40	Apr 10, 23	12 0,14 2	9 15 4 W	16 2,16 6	33 47 2 N	12 5,13 4	28933	28	EI 28	JTH

*Local disturbance

SOUTH AMERICA

PARAGUAY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
San Salvador	22 49 4 S	302 28	Jul 28, '25	10 1,11 8	0 52 2 W	13 7,13 9	12 24 4 S	10 8,11 4	25359	27	EI 27	JL
Concepcion, *A*	23 24 2 S	302 34	Jul 19, 25	10 6,13 6	0 39 6 W	14 0,14 2	13 31 2 S	11 0,13 2	25280	27	EI 27	JL
			Jul 20, 25	7 3 to 17 3(dv)	0 42 0 W			7 3 to 17 3 (dv)	25277	27		JL
			Jul 22, 25			7 0 to 17 3 (dv)	13 31 8 S				EI 27	JL
Concepcion, *B*	23 24 2 S	302 34	Jul 21, 25	10 9,12 2	0 40 0 W	13 1,13 4	13 31 0 S	11 2,11 8	25280	27	EI 27	JL
Trinidad (Asuncion)	25 15 5 S	302 26	Jul 8, 25	10 3,11 7	0 03 2 E	14 1,14 3	16 09 8 S	10 7,11 4	24940	27	EI 27	JL

PERU

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Iquitos, *A*	3 45 6 S	286 45	Apr 26, '24	9 7,11 6	5 06 2 E	15 6,15 9	17 14 4 N	10 1,11 2	30842	28	EI 28	JTH
			Apr 29, 24	8 2 to 17 7 (dv)	5 06 6 E			8 5 to 17 7 (dv)	30872	28		JTH
			May 3, 24			7 7 to 17 4 (dv)	17 12 8 N				EI 28	JTH
			May 15, 24	8 0 to 17 2 (dv)	5 06 8 E					28		JTH
Iquitos, *B*	3 45 6 S	286 45	Apr 27, 24	13 3,14 2	5 07 6 E	11 2,11 5	17 15 0 N	14 6	30871	28	EI 28	JTH
Chimboté de Amazonas	4 00 S	289 09	Apr 22, 24	7 9	4 08 0 E	8 8	17 43 0 N	8 2	30433	28	EI 28	JTH
Paita	5 04 7 S	278 54	Aug 30, 24	13 6,15 4	8 11 2 E			14 0,15 0	31550	28		JTH
Piura, *B*	5 11 4 S	279 22	Sep 3, 24	10 6,14 4	8 10 8 E	9 4, 9 7	11 18 4 N	11 0,12 8	31639	28	EI 28	JTH
Piura, *A*	5 11 7 S	279 23	Sep 2, 24	11 3,15 1	8 12 4 E	10 4,10 8	11 10 8 N	11 7,14 8	31612	28	EI 28	JTH
Quebrada Puma Yaca	9 16 9 S	285 10	Jun 13, 24	10 8	6 49 4 E	12 4	6 01 2 N	11 2	30576	28	EI 28	JTH
Puerto Bermudez, *A*	10 17 8 S	285 13	Jun 24, 24	15 9	7 15 7 E			16 2	29854	28		JTH
			Jun 25, 24	10 9,12 9	7 16 6 E	10 0,10 2	4 19 4 N	11 2,12 3	29866	28	EI 28	JTH
Puerto Bermudez, *B*	10 18 9 S	285 13	Jun 26, 24	12 4,14 9	7 19 5 E	10 7,11 0	4 18 0 N	13 5,14 5	29840	28	EI 28	JTH
La Merced, *A*	11 03 9 S	284 39	Aug 3, 24	14 1	7 40 5 E			14 5,15 6	29858	28		JTH
			Aug 4, 24	9 6,11 6,11 9	7 38 9 E	13 6,14 0	2 42 2 N	10 2,11 2	29878	28	EI 28	JTH
La Merced, *B*	11 03 9 S	284 39	Aug 5, 24	14 6,16 2	7 37 2 E	17 1	2 46 0 N	15 0,15 8	29827	28	EI 28	JTH
Tarma	11 26 0 S	284 18	Aug 7, 24	9 8,11 6	7 58 4 E	9 0, 9 3	2 02 4 N	10 2,11 1	20948	28	EI 28	JTH
			Aug 7, 24			14 2,15 5	2 01 7 N				EI 28	JTH
Huncaayo Observatory, *Frame*	12 02 7 S	284 40	Jun 14, 21	15 9,16 4	8 14 7 E					10		W&W
			Jun 16, 21	14 3,14 8	8 15 0 E					10		W&W
			Jun 17, 21	16 3	8 13 9 E					10		WHW
			Jun 25, 21	13 6,14 1	8 16 1 E					10		W&W
			Jun 28, 21	9 1	8 12 9 E					10		W&W
			Jun 29, 21	9 2,11 4	8 14 0 E					10		WHW
			Jun 30, 21	10 0	8 12 8 E					10		WHW
			Jul 2, 21	10 7,13 8,14 8	8 14 0 E					10		WHW
			Jul 6, 21					11 0	29808	10		W&W
			Jul 9, 21	13 7	8 14 3 E			10 6,11 4	29782	10		W&W
			Jul 11, 21	9 7,15 0	8 13 6 E			10 6	29786	10		W&W
			Jul 12, 21	9 3	8 13 0 E			10 1,15 8	29762	10		WHW
			Jul 13, 21					10 1	29806	10		WHW
			Jul 13, 21	9 3,16 7	8 13 0 E			14 2,16 0	29724	10		WHW
			Jul 14, 21			11 5	0 30 2 N				EI 5	WHW
			Jul 14, 21			14 2,16 0	0 30 4 N				EI 5	WHW
			Jul 18, 21			9 1, 9 8	0 31 6 N				EI 5	WHW
			Jul 18, 21			11 0 11 4	0 31 6 N				EI 5	WHW
			Jul 20, 21	10 5,15 3	8 13 2 E			11 8	29799	10		WHW
			Jul 25, 21	9 4,14 9	8 14 3 E			10 5,14 1	29796	10		WHW
			Jul 27, 21			10 1,11 7	0 31 5 N				EI 5	WHW
			Jul 27, 21			14 3	0 33 4 N				EI 5	WHW
			Aug 1, 21	10 8	8 13 6 E			14 5,16 1	29749	10		WHW
			Aug 4, 21			9 2,10 8	0 34 0 N				EI 5	WHW
			Aug 4, 21			13 6	0 30 6 N				EI 5	WHW
			Aug 8, 21	9 2,14 6	8 16 1 E			10 0,13 9	29776	10		WHW
			Aug 10, 21			9 3,10 5	0 32 8 N				EI 5	WHW
			Aug 10, 21			11 4	0 33 5 N				EI 5	WHW
			Aug 15, 21	8 9 15 9	8 13 7 E			10 0,14 1	29806	10		WHW
			Aug 17, 21			10 0,10 8	0 31 7 N				EI 5	WHW
			Aug 17, 21			11 4	0 30 7 N				EI 5	WHW
			Aug 18, 21	10 1,10 5,16 1	8 12 9 E			14 0,15 5	29750	28		WHW
			Aug 22, 21	9 2,14 5	8 13 9 E			10 6,13 8	29827	28		WHW
			Aug 23, 21			10 2 to 14 1 (5)	0 28 7 N				EI 28	WHW
			Aug 25, 21	9 6,14 4	8 13 3 E			10 5,13 8	29802	28		WHW
			Aug 29, 21	9 3,14 3	8 13 4 E			9 9,13 6	29830	28		WHW

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PERU—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
Huancayo Observatory, *Frame—Concluded*	° ′ 12 02 7 S	° ′ 284 40	*1922*	h h h	° ′	h h	° ′	h h	c g s			
			Mar 2, 8, 15,21	8 6,10 9[1]	8 12 1 E	15 5[2]	0 34 6 N	9 3,10 3[1]	29800	10	EI 5	WFW
			Apr 11,18, 25	9 0,11 4[3]	8 12 3 E	14 2,15 0	0 35 1 N	9 6,10 8	29824	10	EI 5	WFW
			May 3, 9, 16,23	9 0,11 0[4]	8 11 9 E	13 7,14 4[5]	0 36 4 N	9 5,10 6	29792	10	EI 5	W&L
			May 17	9 7 to 11 6 (4)	8 11 5 E					10		CML
			May 18					9 4,11 2	29783	10		CML
			May 18					14 0,16 0	29783	10		CML
			Jun 1, 6, 13,20, 27	8 6,12 9	8 11 6 E	14 0,14 9	0 37 7 N	9 6,11 2	29776	10	EI 5	CML
			Jul 1			9 3,10 4	0 38 6 N				EI 5	CML
			Jul 4,10, 16,24	9 6,13 1	8 11 6 E	13 9,14 7	0 39 0 N	9 6,11 2	29784	10	EI 5	W&L
			Aug 1, 8, 15,21, 29	8 6,12 5	8 10 6 E	13 7,14 4	0 39 2 N	9 5,11 2	29785	10	EI 5	CML
			Sep 5,12, 18,25	8 8,13 1	8 11 1 E	13 9,14 6	0 39 9 N	9 6,11 4	29798	10	EI 5	CML
			Sep 20–21	20 5 to 3 0 (dv)[6]	8 10 8 E					10		CML
			Oct 3,10, 17,24, 30	8 9,13 4[7]	8 11 1 E	14 1,14 7	0 39 5 N	9 6,11 3	29805	10	EI 5	CML
			Nov 6,14, 20,28	8 9,12 0	8 10 8 E	13 7,14 3	0 40 5 N	9 7,11 1	29794	10	EI 5	CML
			Dec 3,10, 18,24, 31	9 1,11 2	8 10 4 E	13 9,14 6	0 41 1 N	9 6,10 6	29791	10	EI 5	WFW
			1923									
			Jan 8,15, 22,29	8 8,13 1	8 10 5 E	13 9,14 6	0 41 5 N	9 6,11 2	29805	10	EI 5	CML
			Feb 5,12, 20,27	9 1,13 4[8]	8 09 2 E	14 2,14 8	0 42 6 N	9 8,11 3	29784	10	EI 5	W&L
			Mar 5,12, 19,26	9 0,11 8[9]	8 09 0 E	13 9,14 5	0 43 9 N	9 7,11 1	29818	10	EI 5	CML
			Apr 2, 9, 16,23, 30	8 9,11 7[10]	8 09 3 E	13 6,14 2	0 44 1 N	9 7,11 2	29830	10	EI 5	CML
			May 7,14, 21,28	9 3,13 2[11]	8 08 2 E	13 9,14 6	0 45 4 N	10 0,11 4	29770	10	EI 5	CML
			Jun 4,11, 18,25	8 8,11 6	8 07 8 E	13 9,14 6[12]	0 45 4 N	9 8,11 3[12]	29764	10	EI 5	P&L
			Jul 2, 9	9 0,11 5	8 09 0 E	14 0,14 6	0 45 5 N	9 6,11 0	29758	10	EI 5	CML
			Sep 5	15 6,16 9	8 08 6 E			16 0,16 6	29735	25		JWG
			Sep 6	8 7,10 0	8 05 4 E	14 0 to 15 2 (6)	0 49 5 N	9 1, 9 7	29795	25	EI 25	JWG
			Sep 6	10 3,11 6	8 05 2 E			10 6,11 3	29794	25	EI 25	JWG
			1924									
			Jul 17,18	8 8,10 3	8 03 9 E			9 3,10 0	29744	10		WCP
			Jul 17	13 5,13 9,15 6	8 04 6 E			14 4,15 2	29722	10		WCP
			Jul 18	10 5,10 7	8 02 6 E					10		WCP
			Jul 18					14 0,14 8	29726	10		JTH
			Jul 21	8 9,10 6	8 06 3 E			9 4,10 2	29735	28		JTH
			Jul 21	13 4,15 0	8 06 4 E			13 8,14 6	29715	28		JTH
			Jul 23	9 1	8 04 2 E			9 6,10 6	29740	28		JTH
			Jul 23	14 2,16 0	8 04 8 E			14 6,15 6	29734	10		RTB
			Jul 27			13 9 to 15 6 (6)	0 55 7 N				EI 5	WCP
			Jul 28			9 1 to 11 1 (6)	0 54 4 N				EI 28	JTH

1 The observations on Mar 2 were at 10^h 3, 14^h 2 in *D*, and at 11^h 0, 13^h 6 in *H*
2 The observations on Mar 21 were at 13^h 4 and 14^h 1
3 The second observation on Apr 11 was at 13^h 8
4 The second observation on May 3 was at 13^h 5
5 There was a second set of observations on May 23 at 15^h 0 and 15^h 8
6 One-minute readings during solar eclipse
7 The second observations on Oct 3 and 24 were at 11 6 and 11 7 respectively
8 The second observation on Feb 27 was at 11^h 4
9 The second observation on Mar 5 was omitted and on Mar 19 the time of second observation was at 13^h 1
10 The second observation on Apr 2 was at 13^h 2
11 The second observation on May 7 was at 11^h 8
12 The observations on Jun 25 were at 10^h 3 and 10^h 7 in *I*, and at 8^h 5 and 9^h 4 in *H*

SOUTH AMERICA

PERU—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′	*1923*	h h h	° ′	h h	° ′	h h	c g s			
Huancayo Observatory[13]	12 02 7 S	284 40	Jul 16,23,30	9 1,13 1[14]	8 05 0 E	13 8,14 2[14]	0 47 4 N	9 9,11 3	29770	10	EI 5	CML
			Aug 6,13,20,27	9 2,11 7[15]	8 04 3 E	13 8,14 3	0 47 9 N	9 9,11 2	29790	10	EI 5	CML
			Sep 5	15 6,16 9	8 05 4 E			16 0,16 6	29726	10		WCP
			Sep 6	8 7 to 11 6(4)	8 01 8 E	14 0 to 15 1 (6)	0 49 2 N	9 1 to 11 2 (4)	29780	10	EI 5	WCP
			Sep 10	12 6to19 1(dv)[16]	8 04 2 E					10		CML
			Sep 11,17,24	8 9,10 8	8 03 8 E	10 9,11 2[17]	0 47 9 N	9 3,10 2	29812	10	EI 5	P&L
			Oct 1, 8,15,22,29	9 1,11 5	8 03 4 E	14 0,14 4	0 49 4 N	9 8,11 0	29782	10	EI 5	CML
			Nov 5,12,19,26	9 2,11 5[18]	8 04 6 E	14 5,14 9	0 48 8 N	9 9,11 1	29794	10	EI 5	CML
			Dec 3,11,17,23,31	8 8,10 5	8 03 5 E	10 5,10 7[18]	0 51 1 N	9 3,10 2	29766	10	EI 5	P&L
			1924									
			Jan 8,15,21,28	8 6,10 2	8 03 2 E	7 2,12 4	0 52 0 N	9 0, 9 8	29784	10	EI 5	P&L
			Jan 22			9 2, 9 5	0 51 8 N				EI 5	CML
			Feb 4,11,18,25	9 2,11 0	8 02 5 E	11 2,11 4[19]	0 52 3 N	9 6,10 6	29770	10	EI 5	P&L
			Mar 2, 9,16,25,31	9 1,11 0	8 02 4 E	11 1,11 4[20]	0 52 6 N	9 6,10 5	29786	10	EI 5	P&L
			Apr 8,14,21,28	9 0,11 0	8 01 9 E	10 8,11 1[21]	0 53 2 N	9 5,10 6	29777	10	EI 5	P&L
			May 5,12,19,26	9 0,13 5[22]	8 01 4 E	14 6,15 4[22]	0 54 4 N	9 7,11 3[22]	29759	10	EI 5	P&B
			Jun 2, 9,16,23,30	8 9,10 4	8 01 7 E	10 8,11 1[23]	0 55 3 N	9 3,10 1	29735	10	EI 5	P&B
			Jun 24			9 1	0 56 3 N				EI 5	RTB
			Jul 7,10,11,21,23	9 0,10 9[24]	8 01 8 E			9 6,10 5	29744	10		P&B
			Jul 10,16,18,21	13 5,15 2	8 01 8 E					10		WCP
			Jul 10,18,21					13 9,14 9	29715	10		WCP
			Jul 7			13 7,14 0	0 55 8 N				EI 5	RTB
			Jul 25			8 6 to 11 3 (6)	0 55 3 N				EI 5	WCP
			Jul 25			14 1 to 15 7 (4)	0 54 0 N				EI 5	WCP
			Jul 26			13 8 to 15 6 (6)	0 57 0 N				EI 5	WCP
			Jul 28			9 1 to 11 1 (6)	0 56 3 N				EI 5	WCP
			Aug 3,12	9 4,10 6	7 58 9 E	11 2,11 4	0 55 2 N	9 7,10 4	29738	10	EI 5	WCP
			Aug 18	10 2,13 4	8 02 8 E					10		DGC
			Aug 19					13 8,14 7	29767	10		DGC
			Aug 20			13 8,14 3	0 55 7 N				EI 5	DGC
			Aug 25	13 6,15 5	8 01 2 E			14 1,15 0	29736	10		RTB
			Aug 26			9 2, 9 9	0 55 7 N				EI 5	RTB
			Sep 1, 8,15,21,29	9 3,11 4[25]	8 01 2 E			9 8,11 0[26]	29778	10		P,B,C

[13] The declination and horizontal-intensity values were determined at station E_m, and the inclination values at station W_m
[14] The second observation in D on July 16 was at 11h 8, and on July 30 there was no second observation in I
[15] The second observation on Aug 27 was at 13h 3
[16] Special observations during total solar eclipse
[17] The observations on Sep 17 were at 13h 5 and 13h 9
[18] The second observation in D on Nov 5 was at 13h 0, those in I on Dec 11 were at 14h 1
[19] The observations on Feb 4 were at 13h 1 and 13h 5, those on Feb 18 were at 13h 8 and 14h 1
[20] The observations on Mar 2 were at 13h 0 and 13h 3
[21] The observations on Apr 14 were at 13h 5 and 13h 8, those on April 21 were at 13h 7 and 14h 1
[22] The observations on May 12 were, in D, at 8h 3, 9h 5, in I, at 7h 1, 7h 4, in H, at 8h 6, 9h 2 The second observation in D on May 19 was at 11h 7
[23] The observations on Jun 9 were at 13h 7 and 14h 1 Only one observation was made on Jun 23, viz, at 13h 8
[24] The second observation on Jul 23 was omitted
[25] The observations on Sep 21 were at 13h 3 and 14h 5
[26] The observations on Sep 15 and 21 were at 13h 8, 14h 8 and 13h 6, 14h 2 respectively

SOUTH AMERICA

PERU—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′	*1924*	h h h	° ′	h h	° ′	h h	c g s			
Huancayo Observatory[13]—*Continued*	12 02 7 S	284 40	Sep 1			7 2, 7 4	0 55 6 N				EI 5	WCP
			Sep 8			14 9,15 3	0 56 8 N				EI 5	RTB
			Sep 16,17			10 2	0 53 2 N				EI 5	DGC
			Sep 21			9 7,10 0	0 56 6 N				EI 5	WCP
			Sep 29,30			14 4	0 54 8 N				EI 5	RTB
			Oct 6,13, 20	8 8,10 2[27]	8 00 0 E	14 1,14 6[28]	0 55 4 N	9 5,10 4	29786	10	EI 5	P,B,C
			Oct 17			8 6, 8 9	0 57 2 N				EI 5	WCP
			Oct 27			10 2,10 8	0 57 0 N				EI 5	DGC
			Nov 7	13 4,14 9	8 01 3 E			13 7,14 6	29724	10		WCP
			Nov 10,17, 24	8 9,11 1	8 01 7 E	13 6,14 2[29]	0 54 8 N	9 6,10 7	29759	10	EI 5	P,B,C
			Dec 1, 9, 15,22, 29	9 0,11 2[30]	8 02 5 E	13 8,14 2	0 57 4 N	9 7,10 8[30]	29764	10	EI 5	P,B,C
			1925									
			Jan 5,12, 19,26	9 7,11 0	8 02 0 E	13 5,13 9	0 57 9 N			10	EI 5	P,B,C
			Jan 5,12, 26					9 7,10 8	29805	10		B&C
			Jan 20					13 6,14 6	29702	10		RTB
			Jan 23	6 7 to 13 0 (dv)[31]	8 00 7 E					10		P,B,C
			Jan 24	6 8 to 13 1 (dv)[31]	8 00 2 E					10		P,B,C
			Jan 25	6 8 to 13 2 (dv)[31]	8 01 0 E					10		P,B,C
			Feb 2, 9, 16,23	9 0,11 0[32]	8 00 3 E	14 2,14 4	0 59 6 N	9 3,11 0[32]	29761	10	EI 5	P&B
			Mar 2, 9, 16,23, 30	9 2,10 6	7 59 3 E	11 1,11 4[33]	1 00 4 N	9 6,10 6	29753	10	EI 5	P&B
			Apr 6,14, 20	9 3,11 1	7 59 8 E	13 6,13 9[34]	1 00 4 N	9 7,10 7	29782	10	EI 5	P&B
			Apr 23			10 2,10 4	0 59 6 N				EI 5	WCP
			Apr 27	6 3, 7 1	7 59 4 E	6 6, 6 8	1 00 5 N			10	EI 5	WCP
			Apr 28					14 2,14 8	29724	10		WCP
			May 4,11, 18	8 8,10 8[35]	7 58 6 E	13 4,13 7[35]	0 59 8 N	9 1,10 3	29735	10	EI 5	P&B
			May 25	7 1, 7 3	8 00 3 E			9 3,10 4	29746	10		RTB
			May 26			10 2,10 5	1 00 7 N				EI 5	RTB
			Jun 4, 9, 15,22	9 2,10 8	7 58 5 E	11 0,11 3[36]	1 01 4 N	9 6,10 5	29749	10	EI 5	G,P,K
			Jun 29	10 3,14 8	7 59 4 E			11 0,14 0	29748	10		AHK
			Jun 30			9 6,10 3	1 02 0 N				EI 5	AHK
			Jul 6,20, 27	9 1,11 6	7 57 9 E	14 3,14 9	1 02 1 N	9 8,11 3	29741	10	EI 5	G&K
			Jul 14			13 8,14 5	1 02 0 N				EI 5	AHK
			Jul 17	8 5,11 5	7 57 4 E			9 3,10 9	29714	10		AHK
			Aug 3,10	8 0,10 9	7 59 3 E			9 2,10 4	29728	10		B&G
			Aug 4,14			9 4, 9 8	1 03 0 N				EI 5	B&G
			Aug 17,24, 31	9 0,11 1[37]	7 57 6 E	14 4,14 8	1 02 4 N	9 6,11 0	29759	10	EI 5	B,G,K
			Sep 6	9 7,11 8	7 59 4 E			10 2,11 3	29784	10		AHK
			Sep 7,23			9 6 10 4[38]	1 03 8 N				EI 5	AHK
			Sep 14,21, 28	8 4,10 8	7 59 4 E	14 0,14 4[38]	1 02 0 N	9 0,10 2	29745	10	EI 5	G&K
			Oct 5,12, 19,26	7 8,10 8	7 58 7 E	13 8,14 1	1 03 3 N	8 9,10 2	29758	10	EI 5	B,G,K
			Nov 2, 9, 16,23, 30	8 1,10 7	7 58 1 E	14 2 14 7[39]	1 03 8 N	9 0,10 2	29733	10	EI 5	B,G,K

[27] The second observation on Oct 6 was at 13h 2
[28] The observations on Oct 13 were at 7h 1 and 7h 3
[29] The observations on Nov 24 were at 11h 0 a 11h 3
[30] The observations on Dec 9 were at 12h 8 and 13h 8 in *D*, and at 13h 0 and 13h 5 in *H*
[31] Special solar-eclipse observations
[32] The observations on Feb 2 were at 13h 4, 14h 9 in *D*, and at 13h 8, 14h 6 in *H*, those on Feb 23 were at 13h 3 and 13h 5 in *D*
[33] The observations on Mar 9, 23 were at 13h 6 and 13h 5 respectively
[34] The observations on Apr 14 were at 11h 5 and 11h 7
[35] The observations on May 11 were at 6h 7 and 7h 3 in *D*, and at 10h 4 and 10h 6 in *I*
[36] The observations on Jun 22 were at 14h 1 and 14h 5
[37] The second observation on Aug 17 was at 13h 4
[38] There were no second observations on Sep 21, 23
[39] The observations on Nov 30 were at 11h 2 and 11h 6

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Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
Huancayo Observatory[11]—*Concluded*	° ′ 12 02 7 S	° ′ 284 40	*1925*	h h h	° ′	h h	° ′	h h	c g s			
			Dec 8,14, 21,28	8 2,11 0	7 57 8 E	14 2,14 6	1 03 9 N	9 0,10 5	29723	10	EI 5	B,G,K
			1926 Jan 4,11, 18,25, 30	8 2,11 2	7 59 2 E	13 8 14 2[40]	1 05 7 N	9 2,10 8	29757	10	EI 5	B,G K
			Feb 8,22	8 3,10 5	7 56 9 E	13 7,14 2	1 04 1 N	8 8,10 0	29726	10	EI 5	B,G,K
			Feb 10,11, 19			14 7,15 0	1 04 8 N				EI 5	B&G
			Feb 15	7 2,11 7	7 57 2 E			9 3,11 3	29788	10		RTB
			Feb 16			9 0, 9 3	1 07 2 N				EI 5	RTB
			Mar 1, 8, 29	8 2,10 7	7 56 9 E	13 8,14 1	1 05 2 N	8 9,10 1	29731	10	EI 5	B,G,K
			Mar 2					9 1,10 3	29728	10		RHG
			Mar 15,21	9 4,11 4	7 57 9 E			9 8,10 9	29768	10		B&G
			Mar 16,22			9 2, 9 5	1 09 6 N				EI 5	B&G
			Apr 5,12, 19,26	8 4,10 7	7 55 8 E	13 8,14 2[41]	1 07 3 N	9 0,10 2	29743	10	EI 5	G&K
			May 3,10, 31	8 1,10 6	7 54 8 E	14 3,14 7	1 09 2 N	8 9,10 1	29690	10	EI 5	G&K
			May 17			14 5,14 8	1 05 6 N				EI 5	RHG
			May 18,25	8 7,10 8	7 54 2 E			9 4,10 4	29711	10		RHG
			May 24			10 9,11 4	1 10 0 N				EI 5	AHK
			Jun 8,14	7 9,11 3	7 55 3 E			9 6,10 7	29698	10		G&K
			Jun 10			9 3, 9 7	1 09 2 N				EI 5	RHG
			Jun 15			14 8,15 2	1 10 8 N				EI 5	RHG
			Jun 21,28	8 7,11 4	7 55 4 E	14 2,14 8[42]	1 10 4 N	9 6,10 8	29749	10	EI 5	AHK
			Jul 5,12, 19,26	8 8,11 1[43]	7 53 4 E	8 9,11 5[44]	1 12 4 N	9 4,10 3	29721	10	EI 5	G,P,K
			Aug 2, 9, 17,23, 31	8 9,11 3[45]	7 53 7 E	8 7,11 5[46]	1 12 1 N	9 4,10 5[47]	29712	10	EI 5	G,P,K
			Sep 7,13, 20,27	9 0,11 2[48]	7 54 4 E	8 8,11 5[49]	1 11 0 N	9 4,10 3	29740	10	EI 5	G,P,K
			Oct 4,11, 15,25	9 0, 9 2[50]	7 55 1 E	8 8,11 4[51]	1 11 9 N	9 2,10 7[51]	29702	10	EI 5	G&P
			Oct 18,21	6 4, 9 6	7 54 8 E	9 9,11 1	1 12 7 N	6 2, 6 7	29557	10	EI 5	G&P
			Nov 1, 8, 15,22, 29	8 8,11 2[52]	7 54 8 E	8 4,11 6[52]	1 12 9 N	9 5,10 7[52]	29699	10	EI 5	G,P,K
			Dec 6,13, 20,27	9 1,11 1[53]	7 55 2 E	8 5,11 5[53]	1 12 9 N	9 6,10 6[53]	29740	10	EI 5	G,P,K
Huancayo Observatory, E_m	12 02 7 S	284 40	Sep 2, '23	14 3 to 17 4(4)	8 05 1 E			14 7 to 17 1 (4)	29731	10		WCP
			Sep 3, 23	11 1 to 17 0(6)	8 03 0 E			11 4 to 16 7 (6)	29774	10		JWG
			Sep 4, 23			15 6 to 17 4 (6)	0 46 0 N				EI 5	JWG
			Sep 3,4, 23	8 5,10 5	8 03 6 E			9 8,12 0	29808	10		WCP
			Sep 5, 23			8 8 to 10 7 (6)	0 47 9 N				EI 5	WCP
			Jul 11, 24	14 6,16 0	8 01 5 E			14 9,15 7	29717	28		JTH
			Jul 14, 24	8 8 to 13 1(4)	8 01 4 E			9 2 to 11 9 (4)	29752	28		JTH
			Jul 15, 24	9 5,11 8	7 59 8 E			9 9,11 5	29756	28		JTH

[40] The observations on Jan 4 were at 15^h 4 and 15^h 6, those on Jan 30 were at 11^h 3 and 11^h 7

[41] The observations on Apr 19 were at 16^h 0 and 16^h 6

[42] The first observation on June 21 was at 8^h 6

[43] The second observation on Jul 19 was at 9^h 6

[44] The observations on Jul 5 were at 14^h 6 and 14^h 9, those on Jul 19 were at 7^h 2 and 9^h 8

[45] The second observation on Aug 9 was at 9^h 7 and on Aug 31 was at 9^h 4

[46] The observations on Aug 9 were at 7^h 2 and 9^h 9, and on Aug 31 were at 7^h 2 and 9^h 6, the second observation on Aug 17 was at 13^h 6

[47] The second observation on Aug 17 was at 9^h 1

[48] The observations on Sep 20 were at 7^h 4 and 9^h 3

[49] The second observation on Sep 7 was at 13^h 4, and the observations on Sep 20 were at 7^h 1 and 9^h 5

[50] The first observation on Oct 11 was at 7^h 3, and the second observations on Oct 4 and 25 were at 11^h 0 and 11^h 2

[51] The second observation in H on Oct 11 was at 8^h 9, the observations on Oct 15 were, in I, at 6^h 6 and 8^h 8 and, in H, at 7^h 0 and 8^h 3

[52] The observations on Nov 1 were, in D, at 6^h 5, 8^h 9, in I, at 6^h 4, 8^h 3, in H, at 6^h 8, 8^h 7 Those on Nov 22 were, in D, at 3^h 6, 8^h 8, in I, at 6^h 5, 9^h 1, and in H at 6^h 9, 8^h 5

[53] The observations on Dec 13 were, in D, at 11^h 3, 13^h 8, in I at 10^h 9, 14^h 0, and in H at 11^h 5, 13^h 5

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Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Huancayo Observatory, *Em—Concluded*	12 02 7 S	284 40	Jul 16, '24	9 0,10 9	8 00 6 E			9 3,10 5	29747	28		JTH
			Jul 17, 24	8 8 to 15 6(5)	8 01 1 E			9 4 to 15 2 (4)	29706	28		JTH
			Jul 18, 24	8 8 to 10 7(4)	7 59 6 E			9 1, 9 9	29732	28		JTH
			Jul 23, 24	14 2	8 02 6 E			14 6,15 7	29715	28		JTH
			Jul 26, 24			13 8 to 15 5 (6)	0 54 8 N				EI 28	JTH
			Jul 27, 24			9 8 to 11 4 (6)	0 53 3 N				EI 5	WCP
			Oct 29, 24	8 8 to 11 6(4)	8 01 0 E			9 5,10 4	29804	10		DGC
			Oct 29, 24	15 8,16 0	7 59 9 E			14 1,14 9	29711	10		DGC
			Oct 30, 24					9 1,10 0	29802	10		DGC
			Oct 30, 24	11 1,11 3	8 01 2 E			13 6,14 5	29742	27		JL
			Oct 30, 24	15 1,15 8	8 00 4 E					27		JL
			Oct 31, 24	10 8,11 1	8 00 8 E			9 2,10 1	29818	27		JL
			Oct 31, 24					15 0,15 8	29734	27		JL
			Nov 3, 24			8 8 to 14 1 (6)	0 56 2 N				EI 5	DGC
			Nov 3, 24			15 1,15 6	0 57 2 N				EI 27	JL
			Nov 4, 24			14 9	0 54 8 N				EI 27	JL
			Nov 5, 24			13 5 to 14 6 (4)	0 54 5 N				EI 27	JL
			Nov 5, 24			15 3,15 7	0 51 8 N				EI 5	DGC
			Nov 6, 24			9 0 to 15 3 (10)	0 56 4 N				EI 5	DGC
Huancayo Observatory, *Wm*	12 02 7 S	284 40	Sep 2, 23	14 3 to 17 4(4)	8 06 1 E			14 7 to 17 1 (4)	29745	25		JWG
			Sep 3, 23	8 5,10 5	8 05 4 E			8 8, 9 5	29783	25		JWG
			Sep 3, 23	11 1 to 17 0(6)	8 05 2 E			11 4 to 16 7 (6)	29768	10		WCP
			Sep 4, 23					10 0,12 0	29800	25		JWG
			Sep 4, 23			15 6 to 17 4 (6)	0 47 0 N				EI 5	WCP
			Sep 5, 23			8 8 to 10 7 (6)	0 47 6 N				EI 25	JWG
			Jul 10, 24	9 1,10 7	8 02 4 E			9 6,10 3	29714	28		JTH
			Jul 10, 24	13 5	8 03 3 E			14 0,15 3	29716	28		JTH
			Jul 11, 24	9 1,10 9	8 03 4 E			9 5,10 5	29776	28		JTH
			Jul 11, 24	14 6,16 0	8 03 0 E			14 9,15 7	29714	10		WCP
			Jul 14 24	8 8 to 13 1(4)	8 03 4 E			9 2 to 11 9 (4)	29747	10		WCP
			Jul 15, 24	9 5,11 8	8 01 9 E			9 9,11 5	29753	10		WCP
			Jul 16, 24	8 9,10 9	8 02 4 E			9 3,10 5	29741	10		WCP
			Jul 16, 24	13 7 to 14 5(4)	8 03 2 E					28		JTH
			Jul 27, 24			9 8 to 15 6 (12)	0 54 8 N				EI 28	JTH
			Oct 29, 24	8 8 to 16 0(6)	8 02 1 E			9 5 to 14 9 (4)	29761	27		JL
			Oct 30, 24					9 1,10 0	29794	27		JL
			Oct 30, 24	11 1,11 3	8 02 4 E			13 6,14 5	29744	10		DGC
			Oct 30, 24	15 1,15 8	8 02 1 E					10		DGC
			Oct 31, 24	10 8,11 2	8 02 9 E			9 2,10 1	29812	10		DGC
			Oct 31, 24					15 0,15 8	29737	10		DGC
			Nov 3, 24			8 9 to 14 1 (6)	1 00 2 N				EI 27	JL
			Nov 3, 24			15 1,15 6	0 56 2 N				EI 5	DGC
			Nov 4, 24			15 0,15 4	0 55 0 N				EI 5	DGC
			Nov 5, 24			13 5 to 14 6 (4)	0 55 8 N				EI 5	DGC
			Nov 5, 24			15 3,15 7	0 55 6 N				EI 27	JL
			Nov 6, 24			9 0 to 15 3 (10)	0 57 5 N				EI 27	JL
Lima, *D*	12 04 3 S	282 58	Oct 16, 24	14 0,15 8	8 31 6 E	12 8,13 0	0 10 4 N	14 6,15 4	30034	27	EI 27	JL
			Oct 17, 24	6 3 to 16 9(dv)	8 31 5 E			6 3 to 16 9 (dv)	30064	27		JL
			Oct 18, 24	6 3 to 16 9(dv)	8 30 0 E			6 3 to 16 9 (dv)	30015	27		JL
			Oct 20, 24			7 4 to 17 6 (dv)	0 06 0 N				EI 27	JL
			Oct 21, 24			6 7 to 17 3 (dv)	0 07 7 N				EI 27	JL

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Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Lima, *E*	12 04 3 S	282 58	Oct 22, '24	10 4,13 9	8 33 5 E	13 5,13 7	0 08 4 N	10 7,12 7	30090	27	EI 27	JL
San Lorenzo Island (Callao Harbor)	12 05 5 S	282 49	Aug 26, 24	11 8	9 26 6 E			12 2	30156	28		JTH
Juliaca, *A*	15 30 0 S	289 51	Aug 20, 23	14 1,16 2	6 34 4 E	14 3,14 5	3 02 6 S	16 6,17 2	28330	25	EI 25	JWG
			Aug 21, 23	8 6, 9 4	6 33 0 E	9 1, 9 2	3 04 4 S	11 7,12 3	28413	25	EI 25	JWG
			Aug 21, 23	11 4,12 6	6 35 7 E					25		JWG
			Dec 3, 24	10 1,12 6	6 30 4 E	13 9,14 1	2 54 4 S	11 7,12 4	28408	27	EI 27	JL
			Dec 4, 24	6 7 to 17 6(dv)	6 26 5 E			6 7 to 17 6 (dv)	28357	27		JL
			Dec 5, 24			6 9 to 17 6 (dv)	2 54 8 S				EI 27	JL
			Feb 7, 26	13 9,15 5	6 18 9 E	11 6,11 8	2 52 0 S	14 4,15 1	28328	27	EI 27	JL
			Feb 8, 26	6 6 to 17 3(dv)	6 21 5 E			6 6 to 17 3 (dv)	28331	27		JL
			Feb 9, 26			6 5 to 18 0 (dv)	2 40 0 S				EI 27	JL
Juliaca, *B*	15 30 0 S	289 51	Aug 20, 23	10 7,12 0	6 32 2 E	13 4,13 6	3 02 4 S	11 0,11 7	28355	25	EI 25	JWG
			Dec 3, 24	15 2,16 5	6 27 0 E	16 9,17 0	2 56 6 S	15 5,16 2	28301	27	EI 27	JL
			Feb 11, 26	10 0,11 3	6 22 4 E	8 8, 9 1	2 46 8 S	10 2,11 0	28375	27	EI 27	JL
Arequipa, *A*	16 22 5 S	288 27	Aug 23, 23	16 2,17 6	7 15 2 E	14 3,14 5	4 57 8 S	16 6,17 2	28392	25	EI 25	JWG
			Aug 24, 23	7 1 to 17 5(dv)	7 14 0 E			7 1 to 17 5 (dv)	28425	25		JWG
			Aug 25, 23			8 7, 8 9	5 04 9 S				EI 25	JWG
			Nov 21, 24	11 0,14 4	7 09 6 E	14 8,15 0	4 58 1 S	11 4,14 0	28442	27	EI 27	JL
			Nov 22, 24	7 5 to 17 3(dv)	7 06 0 E			7 5 to 17 3 (dv)	28394	27		JL
			Nov 24, 24			7 6 to 17 5 (dv)	4 57 8 S				EI 27	JL
			Feb 13, 26	17 5	7 01 0 E	16 8,17 1	4 53 4 S	17 9	28325	27	EI 27	JL
			Feb 15, 26			6 8 to 17 6 (dv)	4 47 7 S				EI 27	JL
			Feb 17, 26			6 8 to 17 7 (dv)	4 50 7 S				EI 27	JL
			Feb 18, 26	7 2 to 17 7(dv)	7 03 5 E			7 2 to 17 7 (dv)	28387	27		JL
			Feb 19, 26	8 0	6 58 7 E			8 3	28341	27		JL
Arequipa, *B*	16 22 5 S	288 27	Aug 25, 23	10 6,11 9	7 22 7 E	13 0,13 2	5 11 4 S	10 9,11 6	28469	25	EI 25	JWG
			Nov 25, 24	10 0,11 3	7 13 6 E	13 6,13 7	5 09 6 S	10 4,11 0	28442	27	EI 27	JL
			Feb 19, 26	10 9,11 9	7 10 0 E	10 4,10 7	4 58 9 S	11 1,11 6	28434	27	EI 27	JL
Arequipa, *C*	16 23 5 S	288 29	Feb 19, 26	16 4	7 53 9 E					27		JL
Arequipa, *D*	16 23 9 S	288 29	Feb 21, 26	10 4,11 6	7 04 4 E	14 5,14 7	5 41 6 S	10 7,11 4	28238	27	EI 27	JL
			Feb 22, 26			6 5 to 17 7 (dv)	5 35 3 S				EI 27	JL
Mollendo, *A*	17 01 8 S	287 59	Nov 15, 24	12 6,14 4	7 28 0 E	11 0,11 3	6 31 6 S	13 2,13 8	27944	27	EI 27	JL
			Nov 16, 24	6 6 to 17 3(dv)	7 27 2 E			6 6 to 17 3 (dv)	27961	27		JL
			Nov 17, 24			7 1 to 17 8 (dv)	6 36 9 S				EI 27	JL
Mollendo, *B*	17 01 8 S	287 59	Nov 18, 24	9 9,10 3	7 26 4 E	12 5 12 6	6 28 7 S	10 6,11 2	28120	27	EI 27	JL

URUGUAY

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Colon, *A*	34 48 3 S	303 45	Dec 22, '25	10 8,14 0	1 57 4 E	14 4,14 6	28 25 3 S	11 2,13 7	24019	27	EI 27	JL
			Dec 24, 25	5 6 to 17 0 (dv)	1 54 8 E			5 6 to 17 0 (dv)	24003	27		JL
			Dec 26, 25			5 8 to 16 7 (dv)	28 26 2 S			27	EI 27	JL
Colon, *B*	34 48 3 S	303 45	Dec 22, 25	16 1,17 3	1 51 4 E	15 6,15 8	28 29 3 S	16 4,17 0	23959	27	EI 27	JL

VENEZUELA

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Castilletes	11 50 5 N	288 40	Oct 30, '26	11 4	0 37 3 E			12 7	29835	156		JCo
			Oct 31, 26	9 0,11 0	0 41 2 E			9 7,10 5	29850	156		JCo
			Nov 1, 26	8 9,10 9	0 43 9 E	13 6	43 21 N	9 4,10 3	29898	156	181 12	JCo
Zapara	10 58 4 N	288 26	Jul 28, 26	8 8,11 1	0 56 4 E			10 5,11 7	30322	156		JCo
			Jul 31, 26	10 1,12 8	0 53 5 E	8 8	41 51 N	10 9 12 6	30366	156	181 1	JCo
			Aug 26, 26	7 7,10 8	0 51 8 E			9 2,10 5	30360	156		JCo

SOUTH AMERICA

VENEZUELA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Zapara—*Concluded*	10 58 4 N	288 26	Aug 29, '26			8 8	41 50 N				181 12	JCo
			Sep 2, 26	7 9,10 4	0 52 6 E			8 6, 9 8	30382	156		JCo
Maracaibo	10 40 4 N	288 25	Nov 23, 22	13 2,15 4	1 16 3 E	12 7,12 9	41 08 4 N	13 6,14 3	30496	25	EI 25	JWG
Carupano	10 39 9 N	296 45	Jan 12, 23	12 8,14 6	3 17 5 W	15 6,15 8	42 09 2 N	13 2,14 1	29574	25	EI 25	JWG
			Jan 13, 23	8 4, 9 8	3 13 4 W	10 6,10 8	42 06 3 N	8 8 9 5	29595	25	EI 25	JWG
Isla Pajaro	10 35 9 N	288 29	Nov 22, 22	8 3, 8 8	1 12 8 E	11 2,11 4	41 10 6 N	9 7,10 4	30481	25	EI 25	JWG
			Nov 22, 22	13 4,14 3	1 08 3 E	13 8,14 1	41 08 8 N	15 3,15 9	30445	25	EI 25	JWG
			Nov 22, 22			16 6,16 8	41 08 4 N				EI 25	JWG
Caracas, *A*	10 30 4 N	293 04	Dec 24, 22	12 6,14 2	1 04 6 W	11 0,11 3	41 29 0 N	13 0,13 8	29952	25	EI 25	JWG
			Dec 25, 22	6 8 to 17 9 (dv)	1 04 7 W			7 3 to 17 7 (dv)	29960	25		JWG
			Dec 26, 22			6 6 to 17 7 (dv)	41 32 3 N				EI 25	JWG
Caracas, *B*	10 30 4 N	293 04	Dec 27, 22	12 8,14 4	1 09 6 W	10 9,11 1	41 34 7 N	13 2,14 1	29954	25	EI 25	JWG
Puerto Cabello	10 28 7 N	291 59	Dec 14, 22	10 1,11 6	0 31 4 W	13 0,13 2	41 24 1 N	10 5,11 2	30109	25	EI 25	JWG
			Dec 15, 22	6 6 to 17 8 (dv)	0 32 3 W					25		JWG
Barcelona, *B*	10 08 6 N	295 18	Jan 7, 23	15 6,17 4	2 19 4 W	13 8,14 0	41 19 2 N	16 0,17 1	29710	25	EI 25	JWG
Barcelona, *A*	10 08 5 N	295 18	Jan 7, 23	9 9,11 4	2 16 0 W	12 6,12 8	41 19 3 N	10 3,11 0	29729	25	EI 25	JWG
Barquisimeto	10 04 8 N	290 42	Dec 19, 22	12 5,14 0	0 13 2 E	11 3,11 5	40 31 8 N	13 0,13 7	30310	25	EI 25	JWG
La Ceiba	9 28 3 N	288 57	Nov 25, 22	15 8,17 0	1 11 2 E	15 0,15 2	39 30 0 N	16 1,16 7	30602	25	EI 25	JWG
Ciudad Bolivar, *A*	8 09 1 N	296 28	Feb 14, 23			16 2,16 5	38 50 2 N				EI 25	JWG
			Feb 15, 23	9 0,10 5	2 29 4 W	11 4,11 7	38 49 4 N	9 4,10 2	30107	25	EI 25	JWG
			Feb 15, 23	13 6,15 1	2 29 8 W			14 0,14 7	30094	25		JWG
			Feb 20, 23	9 5 to 17 7 (dv)	2 29 9 W					25		JWG
Ciudad Bolivar, *B*	8 09 1 N	296 26	Feb 14, 23	14 8,19 1	2 32 0 W			15 7,16 6	30058	28		JTH
			Feb 15, 23	7 8 to 17 8 (dv)	2 28 6 W					28		JTH
			Feb 16, 23			10 4,10 7	39 01 5 N				EI 28	JTH

ISLANDS, ATLANTIC OCEAN

AZORES

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	H.I. LMT	H.I. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Santa Cruz*	39 26 8 N	328 52	Jun 16, '25	12 8,15 6	21 19 6 W	16 5,16 7	67 44 2 N	14 2,15 1	21976	26	EI 26	JES
Angra*	38 38 8 N	332 47	Jun 14, 25	7 0, 8 9	18 17 4 W	10 5,10 8	61 35 4 N	7 4, 8 5	22392	26	EI 26	JES
			Jun 18, 25	15 2,16 9	18 24 4 W	17 8	61 32 3 N	15 6,16 5	22426	26	EI 26	JES
Horta*	38 31 6 N	331 22	Jun 15, 25	14 9,16 8	19 59 7 W	13 6,13 9	64 42 7 N	15 4,16 4	20659	26	EI 26	JES
Ponta Delgada, *C**	37 47 2 N	334 14	Jun 12, 25	13 1	19 40 1 W	16 4	60 23 2 N	13 7,14 6	22509	26	EI 26	JES
Ponta Delgada Observatory, *B**	37 46 4 N	334 21	Jun 3, 25	14 0,18 0	23 28 5 W			14 6,17 0	21952	26		JES
			Jun 10, 25	9 9,11 8	23 26 2 W	12 8,13 0	62 15 8 N	10 4,11 4	21922	26	EI 26	JES
Ponta Delgada Observatory, *Central Pier**	37 46 4 N	334 21	Jun 2, 25			10 7,11 1	60 02 6 N				EI 26	JES
			Jun 2, 25			11 6,11 8	60 02 4 N				EI 26	JES
			Jun 2, 25			12 7,13 1	60 04 8 N				EI 26	JES
			Jun 2, 25			13 6,13 9	60 03 0 N				EI 26	JES
			Jun 2, 25			14 8,15 1	60 04 3 N				EI 26	JES
			Jun 8, 25			15 7,16 1	60 06 2 N				EI 26	JES
			Jun 10, 25	13 8,15 4	18 58 6 W	16 6,17 0	60 04 0 N			26	EI 26	JES
Ponta Delgada Observatory, *Central Pier +7**	37 46 4 N	334 21	Jun 1, 25	17 0,17 2	18 59 4 W			12 3,13 1	23150	26		JES
			Jun 8, 25	14 0	18 57 9 W			10 7,13 4	23136	26		JES
Ponta Delgada Observatory, *Earth-Inductor Pier**	37 46 4 N	334 21	Jun 2, 25			16 3,16 8	59 54 8 N				EI 26	JES
			Jun 8, 25			16 8,17 2	59 55 9 N				EI 26	JES
			Jun 10, 25			17 5,17 7	59 55 6 N				EI 26	JES
Ponta Delgada, *A**	37 44 8 N	334 20	May 24, 25	11 0,11 2	21 17 8 W					26		JES
			May 25, 25	8 6,10 9	21 15 2 W	12 1,12 4	59 58 3 N	9 2,10 2	23066	26	EI 26	JES
			May 25, 25	13 2,13 4	21 21 3 W					26		JES
			May 26, 25			14 7,14 9	59 56 5 N				EI 26	JES
			May 26, 25			15 2,15 4	59 56 6 N				EI 26	JES
Ponta Delgada, *A+7**	37 44 8 N	334 20	May 26, 25	8 1, 9 0	21 12 5 W			10 0,11 0	23072	26		JES
			May 29, 25					6 8,17 8	23074	26		JES
			May 31 25	14 5,14 8	21 21 6 W			11 0,12 3	23060	26		JES

* Local disturbance

ISLANDS, ATLANTIC OCEAN

AZORES—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Ponta Delgada, *AA**	37 44 8 N	334 20	May 26, '25			16 6	60 00 1 N				EI 26	JES
			May 27, 25			6 4 to 18 4 (dv)	59 59 2 N				EI 26	JES
			Jun 4, 25			12 0	59 59 6 N				EI 26	JES
			Jun 6, 25			16 2,16 5	60 00 9 N				EI 26	JES
			Jun 6, 25			16 9,17 2	60 00 8 N				EI 26	JES

BAHAMAS

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Governor's Harbor	25 12 3 N	283 45	Jul 8, '22	12 9,15 6	1 11 2 W	11 4,11 6	58 23 2 N	14 5,15 3	26482	26	EI 26	WAL
Nassau, *C*	25 05 5 N	282 39	Jul 3, 22	13 1,15 1	0 10 4 W	11 1,11 3	58 06 2 N	13 9,14 8	26788	26	EI 26	WAL
Nassau, *A*	25 04 5 N	282 39	Jul 4, 22	12 6,13 1	0 09 8 W	15 8,16 0	58 07 4 N	13 6,14 5	26820	25	EI 25	JWG
			Jul 6, 22	6 8, 8 4	0 02 8 W	10 9,11 2	58 04 6 N	7 3, 8 0	26849	25	EI 25	JWG
Nassau, *B*	25 04 5 N	282 39	Jul 5, 22	6 0 to 18 1(dv)	0 06 7 W					25		JWG
			Jul 15, 22	5 9 to 18 2(dv)	0 06 4 W					25		JWG
Rock Sound	24 51 8 N	283 50	Jul 10, 22	9 5,11 6	0 57 3 W	13 3,13 6	57 55 6 N	10 0,11 0	26710	25	EI 25	JWG
Fresh Creek	24 43 7 N	282 13	Jul 19, 22	10 9,14 2	0 25 2 E	15 0,15 2	57 48 2 N	11 4,13 8	27007	26	EI 26	WAL
Bight Settlement	24 18 5 N	284 33	Jul 29, 22	10 5,11 9	1 17 6 W	14 0,14 4	57 50 4 N	10 9,11 6	26509	25	EI 25	G&L
Green Cay	24 02 0 N	282 50	Jul 13, 22	9 7,12 4	0 19 0 E	13 5,13 8	57 07 6 N	10 3,11 4	27256	26	EI 26	WAL
Farmer's Cay	23 57 5 N	283 42	Aug 5, 22	14 1,15 8	0 10 8 W	16 4,16 6	57 06 4 N	14 5,15 4	27064	25	EI 25	G&L
Port Nelson	23 38 7 N	285 09	Jul 31, 22	14 2,15 8	1 31 6 W	11 0,11 4	56 59 2 N	14 6,15 4	26990	25	EI 25	JWG
Port Nelson, *Secondary*	23 38 7 N	285 09	Jul 31, 22	7 4 to 18 2(dv)	1 30 6 W					26		WAL
George Town	23 30 8 N	284 14	Aug 4, 22	8 9,10 9	0 11 4 W	12 5,12 6	56 41 0 N	9 4,10 5	27226	26	EI 26	G&L
Galloway	23 02 7 N	285 02	Aug 3, 22	9 0,10 6	1 03 4 W	11 3,11 5	56 08 5 N	9 4,10 2	27315	25	EI 25	G&L
Albert Town	22 36 6 N	285 39	Aug 2, 22	8 8,10 8	0 45 6 W	11 6,11 8	56 08 2 N	9 3,10 4	27244	26	EI 26	G&L

BERMUDA[1]

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
St George*	32 23 1 N	295 19	Aug 14, '22	13 8,16 4	12 50 4 W	12 8	65 04 2 N	14 2,15 7	22418	17	EI 3	F&H
Nonsuch Island*	32 20 9 N	295 20	Aug 15, 22	11 2,13 7	11 48 6 W	14 5	65 27 3 N	11 7,13 3	21898	17	EI 3	F&H
Ireland Island*	32 19 4 N	295 10	Aug 19, 22	13 3,15 7	11 30 0 W	11 5	66 22 7 N	13 8,15 2	21485	17	EI 3	F&H
Agar's Island*	32 17 6 N	295 11	Aug 5, 22	11 4,14 8	12 39 2 W	15 8	67 55 2 N	12 2,14 1	20109	17	EI 3	F&H
			Sep 4, 22			8 9 to 18 3 (dv)	67 55 7 N				EI 3	HWF
			Sep 5, 22			8 1 to 18 7 (dv)	67 55 5 N				EI 3	HWF
			Sep 6, 22	7 3 to 17 7(dv)	12 38 7 W			7 3 to 17 7 (dv)	20120	17		HWF
			Sep 12, 22	7 5 to 18 1(dv)	12 37 4 W			7 5 to 18 1 (dv)	20110	17		HWF
Agricultural Station*	32 17 5 N	295 14	Aug 23, 22	10 9,13 3	14 25 6 W	15 1	66 17 9 N	11 5,12 9	21538	17	EI 3	HWF
Mont Royal, *A**	32 16 7 N	295 12	Jul 10, 22	15 6 17 7	11 27 8 W			16 2,17 3	21862	17		HWF
			Jul 11, 22			10 6	66 25 9 N				EI 3	HWF
			Jul 11, 22			17 2	66 26 3 N				FI 6	HWF
			Jul 18, 22			14 2	66 25 3 N				EI 3	HWF
			Jul 19, 22	15 2	11 28 4 W					14		HWF
			Sep 18, 22	10 7,16 7	11 29 0 W	9 0	66 27 4 N	12 7,14 9	21854	14	EI 3	JTH
Mont Royal, *C**	32 16 7 N	295 12	Jul 20, 22	12 0,14 2	11 14 0 W			15 2,17 7	21966	17		F&H
			Jul 29, 22			14 9,15 6	66 23 8 N				EI 6	F&H
			Jul 29, 22			16 2,16 6	66 23 4 N				EI 6	F&H
Spectacle Island*	32 15 6 N	295 10	Jul 13, 22	11 8,14 4	8 21 4 W			12 1,14 0	22356	17		HWF
			Sep 2, 22			16 1	65 27 9 N				EI 6	JTH
			Sep 4, 22			9 9	65 28 8 N				EI 6	JTH
			Sep 5, 22			9 2,17 7	65 28 5 N				EI 6	JTH
Black Bay*	32 15 3 N	295 09	Aug 21, 22	12 4,17 3	8 14 4 W	12 7	65 23 N	13 6,16 4	22114	14	14 3d	JTH
			Aug 29, 22	15 4	8 13 6 W	11 4	65 26 5 N	17 5	22155	14	EI 3	F&H

CANARY ISLANDS

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Santa Cruz (La Palma)	28 41 4 N	342 16	Aug 3, '25	10 4,11 9	20 38 5 W	12 8,13 0	52 14 4 N	10 8,11 6	25776	26	EI 26	JES
Santa Cruz (Tenerife)	28 28 1 N	343 45	Aug 4, 25	13 4,13 6	12 44 0 W	16 0,16 4	45 48 6 N	14 0,14 8	25798	26	EI 26	JES
			Aug 4, 25	15 2,15 4	12 42 4 W					26		JES
			Aug 5, 25	7 2, 8 5	12 34 0 W	9 5, 9 6	45 46 2 N	7 5, 8 2	25788	26	EI 26	JES

* Local disturbance

[1] See also values at secondary stations in Table of Results in Bermuda magnetic anomaly, pp 105–108

ISLANDS, ATLANTIC OCEAN

CANARY ISLANDS—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Las Palmas, *A*	28 07 7 N	344 33	Aug 8, '25	10 5,12 8	16 06 1 W	13 4,13 5	45 15 6 N	11 4,12 5	27586	26	EI 26	JES
			Aug 13, 25	6 2 to 18 3(dv)	16 04 8 W			6 2 to 18 3 (dv)	27567	26		JES
			Aug 15, 25			6 3 to 18 2 (dv)	45 14 2 N				EI 26	JES
Las Palmas, *B*	28 07 2 N	344 33	Aug 17, 25	13 2,15 0,15 2	15 53 7 W	16 6,16 8	45 32 6 N	13 8,14 6	27530	26	EI 26	JES

FALKLAND ISLANDS

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Port Louis	51 33 S	301 53	Apr 22, '25	11 7,13 4	9 13 8 E	14 9,15 1	45 31 8 S	12 1,13 0	25578	27	EI 27	JL
Port Stanley, *A*	51 41 2 S	302 10	Apr 3, 25	12 2,15 1	9 05 2 E	11 4,11 6	45 42 0 S	14 0,14 8	25563	27	EI 27	JL
			Apr 4, 25	6 6 to 17 7(dv)	9 02 2 E			6 6 to 17 7 (dv)	25580	27		JL
			Apr 6, 25	6 8 to 17 7(dv)	9 02 7 E			6 8 to 17 7 (dv)	25577	27		JL
			Apr 7, 25			6 7 to 17 4 (dv)	45 42 2 S				EI 27	JL
			Apr 8, 25			6 7 to 17 1 (dv)	45 41 4 S				EI 27	JL
			Apr 9, 25			6 6 to 17 4 (dv)	45 40 9 S				EI 27	JL
			Apr 10, 25	6 6 to 17 4(dv)	9 02 7 E			6 6 to 17 4 (dv)	25577	27		JL
Port Stanley, *B*	51 41 7 S	302 07	Apr 14, 25	10 6,11 9	9 03 6 E	13 6,13 8	45 41 5 S	11 0,11 6	25562	27	EI 27	JL
Port Stanley, *C*	51 41 7 S	302 07	Apr 14, 25	16 6	9 02 9 E	16 3,16 5	45 40 8 S			27	EI 27	JL
			Apr 15, 25	11 3	9 02 9 E			10 4,11 0	25568	27		JL
Between-the-Rocks	51 48 2 S	301 40	Apr 18, 25	9 8,11 1	9 33 0 E	11 6,11 8	45 50 4 S	10 1,10 8	25612	27	EI 27	JL

MADEIRA

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Funchal, *A**	32 38 0 N	343 05	Jun 23, '25	7 9,11 3	18 39 0 W	12 4,12 7	52 35 9 N	9 9,10 8	25696	26	EI 26	JES
			Jun 24, 25	13 1,15 2,15 5	18 45 1 W	16 4,16 7	52 42 5 N	13 7,14 7	25736	26	EI 26	JES
Funchal, *B**	32 37 8 N	343 05	Jun 27, 25	10 1,11 9	18 43 2 W			10 7,11 5	25312	26		JES
			Jun 30, 25	16 0,16 2	18 44 3 W	15 2,15 4	51 43 8 N			26	EI 26	JES
Funchal, *C**	32 37 2 N	343 04	Jun 25, 25	9 1,10 8	15 33 8 W	11 7,12 0	52 19 6 N	9 5,10 3	25388	26	EI 26	JES
Funchal, *D**	32 37 2 N	343 04	Jun 25, 25	14 1,15 7	16 19 6 W	17 0,17 2	51 39 8 N	14 5,15 3	25463	26	EI 26	JES

WEST INDIES

Station	Latitude	Long East of Gr	Date	Declination LMT	Declination Value	Inclination LMT	Inclination Value	Hor Intensity LMT	Hor Intensity Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Havana, *Casa Blanca, A*	23 09 4 N	277 39	Aug 16, '22	12 9,15 2	3 19 0 E	10 9,11 1	55 04 0 N	13 5,14 6	28381	26	EI 26	WAL
			Aug 17, 22	6 6 to 16 0 (dv)	3 22 0 E			6 9 to 15 7 (dv)	28399	26		WAL
			Sep 19, 24	9 9,11 5	3 20 8 E	12 8,13 1	55 13 0 N	10 4,11 1	28244	27	EI 27	JL
			Sep 20, 24	6 7 to 17 2 (dv)	3 19 2 E			6 7 to 17 2 (dv)	28239	27		JL
			Sep 22, 24			8 2 to 17 8 (dv)	55 11 6 N				EI 27	JL
Havana, *Casa Blanca, B*	23 09 4 N	277 39	Sep 23, 24	9 5,11 7	3 06 2 E	12 8,13 1	55 17 7 N	10 5 11 4	28142	27	EI 27	JL
Havana, *Casa Blanca, Secondary*	23 09 4 N	277 39	Aug 17, 22			6 7 to 14 0 (dv)	55 08 4 N				EI 25	JWG
Havana, *Villa*	23 06 4 N	277 39	Aug 16, 22	13 3,15 1	3 24 4 E	15 8,16 0	54 56 4 N	13 7,14 7	28538	25	EI 25	JWG
Matanzas	23 03 6 N	278 27	Aug 30, 22	9 8,11 6	2 48 8 E	13 5,13 7	55 10 4 N	10 2,11 2	28270	26	EI 26	WAL
Carenero Cayos	22 55 1 N	280 14	Dec 23, 26			15 6	55 25 N				125 4	SEL
Pinar del Rio	22 25 6 N	276 18	Aug 26, 22	12 7,14 2	4 17 8 E	10 9,11 2	53 53 6 N	13 1,13 8	28811	26	EI 26	WAL
Placetas del Norte, *B*	22 20 9 N	280 22	Sep 2, 22			8 2, 8 4	54 56 8 N				EI 26	WAL
			Sep 2, 22	12 7,14 4	1 11 4 E	15 5,15 7	54 52 8 N	13 1,14 0	27966	26	EI 26	WAL
			Sep 3, 22	6 5 to 16 7 (dv)	1 13 8 E					26		WAL
			Sep 4, 22	6 9, 8 5	1 18 5 E			7 3, 8 2	27918	26		WAL
Placetas del Norte, *A*	22 18 6 N	280 23	Sep 4, 22	12 6,14 1	2 53 8 E	11 6,11 7	54 10 0 N	13 0,13 7	28350	26	EI 26	WAL
Camaguey, *B**	21 20 6 N	282 09	Sep 9, 22	13 5,15 1	1 15 6 E	15 7,15 9	54 06 6 N	13 9,14 8	28343	26	EI 26	WAL

* Local disturbance

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Camaguey, *A**	21 20 5 N	282 09	Sep 8, '22	13 6,15 3	1 10 2 E	11 1,11 3	53 53 4 N	14 0,15 0	28615	26	EI 26	WAL
			Sep 9, 22	7 6, 9 0	1 17 6 E	7 2, 7 3	53 53 4 N	8 0, 8 6	28572	26	EI 26	WAL
Santiago, *San Juan Hill, A*	20 00 2 N	284 13	Sep 13, 22	13 4,15 0	0 53 1 E	12 6,12 8	52 57 2 N	13 9,14 2	28421	26	EI 26	WAL
			Sep 13, 22			16 2,16 4	52 55 6 N				EI 26	WAL
			Sep 14, 22	7 2, 8 6	0 56 4 E			7 5, 8 3	28404	26		WAL
Santiago, *San Juan Hill, B*	20 00 2 N	284 13	Sep 14, 22	12 4,14 2	0 57 1 E	11 4,11 6	53 06 9 N	12 8,13 8	28336	26	EI 26	WAL
Guantanamo Bay	19 54 6 N	284 52	Sep 16, 22	15 6,17 0	0 02 0 W			16 0,16 7	28332	26		WAL
Puerto Plata	19 49 0 N	289 18	Oct 14, 22	14 8,16 4	0 49 3 W	13 6,13 8	53 07 4 N	15 2,16 0	27974	25	EI 25	JWG
			Oct 15, 22	6 0 to 17 8 (dv)	1 49 0 W					25		JWG
Cap Haitien	19 46 4 N	287 48	Oct 9, 22	12 9,14 4	0 59 8 W	15 3,15 5	52 56 1 N	13 3,14 1	28014	25	EI 25	JWG
			Oct 10, 22	9 5,11 5	0 54 4 W					25		JWG
Gonaives	19 25 8 N	287 18	Oct 2, 22	12 4,14 0	0 21 4 W	11 6,11 7	52 04 8 N	12 8,13 6	28718	25	EI 25	JWG
			Oct 3, 22	5 9 to 18 1 (dv)	0 21 7 W					25		JWG
L'Atallye	19 21 7 N	287 43	Oct 5, 22	12 8,15 0	0 44 1 W	15 4,15 6	52 30 4 N	13 3,14 4	28440	25	EI 25	JWG
La Vega	19 14 7 N	289 28	Oct 19, 22	12 3,13 7	1 27 9 W	11 1,11 4	52 04 8 N	12 7,13 4	28236	25	EI 25	JWG
Sanchez	19 14 3 N	290 23	Oct 21, 22	9 2,10 7	2 13 6 W	8 2, 8 4	52 16 8 N	9 5,10 3	28093	25	EI 25	JWG
Port au Prince, *A*	18 34 2 N	287 41	Sep 18, 22	12 8,14 5	0 26 2 W	11 4,11 6	50 59 0 N	13 2,14 0	28860	25	EI 25	JWG
			Sep 19, 22	8 1, 8 5	0 22 0 W			9 0,10 0	28856	25		JWG
			Sep 19, 22	10 4,11 7	0 25 2 W	15 5,15 7	51 01 0 N			25	EI 25	JWG
Port au Prince, *B*	18 34 2 N	287 41	Sep 20, 22	10 4,12 1	0 26 6 W	12 6,13 3	50 59 2 N	10 8,11 6	28903	25	EI 25	JWG
Montego Bay	18 28 5 N	282 04	Oct 5, 22	14 6,16 6	2 18 9 E			14 9,16 0	29372	26		WAL
			Oct 6, 22	6 7 to 17 0(dv)	2 15 1 E					26		WAL
			Oct 7, 22			10 1,10 5	50 05 6 N				EI 26	WAL
Santo Domingo, *A*	18 27 8 N	290 06	Oct 30, 22	12 7,13 2	2 08 6 W	11 3,11 5	51 31 1 N			25	EI 25	JWG
			Oct 30, 22	13 7,14 2	2 09 0 W	16 7,16 8	51 34 8 N	15 4,16 1	28170	25	EI 25	JWG
			Oct 31, 22	7 4, 8 2, 9 0	2 09 8 W	10 1,10 3	51 34 7 N	7 7, 8 6	28164	25	EI 25	JWG
			Nov 1, 22	6 1 to 17 6 (dv)	2 11 0 W					25		JWG
Santo Domingo, *B*	18 27 8 N	290 06	Oct 31, 22	13 0,14 6	2 03 9 W	11 4,11 5	51 32 3 N	13 4,14 2	28177	25	EI 25	JWG
Asua	18 27 7 N	289 16	Nov 3, 22	15 5,17 0	1 05 6 W			15 8,16 6	28226	25		JWG
			Nov 4, 22	11 1	1 04 2 W	10 6,10 9	51 26 4 N			25	EI 25	JWG
La Romana	18 24 1 N	291 03	Oct 26, 22	12 6,14 1	2 23 5 W	15 1,15 2	51 39 6 N	12 9,13 7	28256	25	EI 25	JWG
Charlotte Amalie	18 20 5 N	295 05	Mar 10, 22	9 8,11 6	4 11 7 W	14 0,14 2	51 35 6 N	10 3,11 3	27948	26	EI 26	HRG
			Mar 11, 22	13 7,15 4	4 14 1 W	16 2	51 39 1 N	14 1,15 0	27940	26	EI 26	HRG
Aux Cayes	18 11 3 N	286 17	Sep 25, 22	10 1,11 6	0 40 4 E	12 6,12 9	50 31 7 N	10 5,11 2	29098	25	EI 25	JWG
Port Antonio	18 11 1 N	283 33	Oct 14, 22	10 4,12 5	2 05 4 E	14 7,15 0	50 41 6 N	10 8,13 1	28923	26	EI 26	WAL
Mandeville	18 01 3 N	282 31	Oct 3, 22	10 0,11 5	2 38 5 E	14 0,14 2	50 07 0 N	10 4,11 2	29354	26	EI 26	WAL
Kingston, Jamaica, *A*	17 58 9 N	283 11	Sep 4, 22	10 3,12 5	1 09 2 E	13 2,13 5	50 03 3 N	10 7,11 5	29600	25	EI 25	JWG
			Sep 9, 22	6 0 to 18 0(dv)	1 10 3 E					25		JWG
			Sep 22, 22	9 8,11 3	1 10 8 E			10 2,11 0	29578	26		WAL
			Sep 28, 22			16 2,16 4	50 03 7 N				EI 26	WAL
			Oct 19, 22	9 8,11 7	1 10 4 E	12 5,12 7	50 05 2 N	10 3,11 4	29555	26	EI 26	WAL
Kingston, Jamaica, *B*	17 58 9 N	283 11	Sep 23, 22	9 7,11 2	1 11 4 E			10 1,10 9	29580	26		WAL
			Sep 28, 22			14 6,14 9	50 04 0 N				EI 26	WAL
Kingston, Jamaica, *Secondary*	17 58 9 N	283 11	Sep 26, 22	6 6 to 17 5(dv)	1 15 2 E			6 8 to 17 4 (dv)	29570	26		WAL
			Sep 29, 22			6 4 to 17 4 (dv)	50 04 3 N				EI 26	WAL
Christiansted	17 45 0 N	295 17	Mar 18, 22	9 6,11 5	4 42 0 W	14 9,15 2	51 04 9N	10 1,11 0	27971	26	EI 26	HRG
			Mar 20, 22	6 7 to 17 0(dv)	4 43 6 W					26		HRG
Frederiksted	17 43 1 N	295 07	Mar 22, 22	10 8,14 1	4 23 6 W	14 9,15 1	50 53 5 N	11 3,13 6	28057	26	EI 26	HRG
			Mar 23, 22					9 6	28032	26		HRG
Basse Terre	17 17 0 N	297 17	Mar 29, 22	9 5,11 5	5 53 0 W	15 0,15 4	50 22 4 N	10 1,11 1	28258	26	EI 26	HRG
St Johns	17 07 0 N	298 09	Apr 3, 22	15 0,16 7	6 27 8 W			15 4,16 3	27642	26		HRG
			Apr 4, 22			11 5,11 8	50 43 4 N				EI 26	HRG
La Jaille	16 16 0 N	298 27	Apr 12, 22			16 5,16 7	49 44 2 N				EI 26	HRG
			Apr 13, 22	9 6, 11 4	5 45 8 W			10 2,11 1	28115	26		HRG
Roseau	15 18 0 N	298 38	Apr 17, 22	10 1	5 54 7 W	16 8,16 9	48 16 1 N	10 9,14 8	28316	26	EI 26	HRG
			Apr 19, 22	8 2, 8 5	5 53 8 W					26		HRG
Fort de France	14 35 9 N	298 55	Apr 29, 22	9 3,11 5	5 21 8 W	14 8,15 0	47 17 3 N	10 1,10 9	28502	26	EI 26	HRG
Port Castries	14 01 1 N	299 02	Apr 25, 22			16 6,16 9	47 23 6 N				EI 26	HRG
			Apr 26, 22	9 9,12 0	5 06 6 W			10 6,11 6	28358	26		HRG
Kingstown, St Vincent, *A*	13 09 2 N	298 46	Jan 29, 23	9 2,10 1,10 9	4 50 4 W	11 6,11 8	45 41 4 N	9 6,10 5	28708	25	EI 25	JWG
			Jan 29, 23	13 5,15 2,15 9	4 57 1 W	16 8,17 0	45 43 2 N	13 8,15 6	28684	25	EI 25	JWG
Kingstown, St Vincent, *B*	13 09 2 N	298 46	Jan 29, 23	9 7,11 5	4 45 6 W	13 4,14 1	45 41 5 N	10 2,11 1	28702	28	EI 28	JTH
Bridgetown, *A*	13 04 8 N	300 25	Jan 25, 23	11 4,12 8	6 20 4 W	10 5,10 7	45 33 1 N	11 7,12 4	28642	25	EI 25	JWG
			Jan 26, 23	6 9 to 17 9(dv)	6 19 8 W			7 3 to 17 7 (dv)	28638	25		JWG
Bridgetown, *B*	13 04 8 N	300 25	Jan 25, 23	10 7,12 9	6 19 6 W	16 4,16 8	45 32 4 N	11 4,12 4	28642	28	EI 28	JTH

* Local disturbance

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Bridgetown, *B*—*Concluded*	13 04 8 N	300 25	Jan 26, '23			7 2 to 18 0 (dv)	45 30 1 N				EI 28	JTH
Willemstad, *A*	12 07 0 N	291 04	Nov 14, 22	13 8,14 2	0 28 0 W	13 2,13 4	43 26 8 N	15 9,16 6	30107	25	EI 25	JWG
			Nov 14, 22			17 1,17 2	43 29 7N				EI 25	JWG
			Nov 15, 22	6 3 to 17 8(dv)	0 25 3 W					25		JWG
			Nov 16, 22	8 2, 8 6,10 2	0 24 2 W	10 9,11 0	43 27 6 N	9 0, 9 8	30097	25	EI 25	JWG
			Jun 18, 26	12 0,	0 46 8 W			13 3	29736	156		JCo
Willemstad, *B*	12 06 9 N	291 04	Nov 16, 22	13 7,16 4	0 23 7 W	13 0,13 4	43 23 9 N	15 4,16 0	30060	25	EI 25	JWG
Willemstad, *1913*	12 06 5 N	291 05	Nov 13, 22	15 3,16 8	0 27 8 W	14 0,14 2	43 22 0 N	15 7,16 4	29966	25	EI 25	JWG
Toco	10 50 1 N	299 04	Jan 22, 23	10 7,12 0	4 44 9 W	12 3,12 5	42 32 6 N	11 1,11 7	29273	25	EI 25	JWG
Port of Spain, *A*	10 40 0 N	298 29	Jan 16, 23	15 1,16 7	4 22 2 W			15 6,16 4	29434	25		JWG
			Jan 17, 23	6 5 to 18 0(dv)	4 20 8 W					25		JWG
			Jan 18, 23	7 9, 9 1	4 21 2 W	10 5,10 7	42 09 5 N	8 2, 8 8	29481	25	EI 25	JWG
			Jan 18, 23			14 2,14 3	42 13 4 N	12 7,13 5	29432	25	EI 25	JWG
			Jan 18, 23			16 8,17 0	42 12 4 N				EI 25	JWG
Port of Spain, *B*	10 40 0 N	298 28	Jan 11, 23	7 4 to 17 0(dv)	4 20 0 W					28		JTH
			Jan 12, 23	11 4,14 2	4 22 2 W	15 9	42 13 3 N	12 5,13 7	29442	28	EI 28	JTH
			Jan 16, 23	9 9,12 9,13 1	4 19 5 W			10 4,11 5	29471	28		JTH
			Jan 16, 23					15 6,16 6	29446	28		JTH
			Feb 27, 23	12 6 to 17 3(dv)	4 22 7 W					25		JWG
			Feb 28, 23	6 8 to 18 0(dv)	4 22 7 W					25		JWG
Port of Spain, *1905*	10 40 0 N	298 28	Jan 9, 23	10 9,16 7	4 19 1 W			13 6,16 1	29419	28		JTH
			Jan 10, 23			13 5,14 2	42 13 2 N				EI 28	JTH
			Jan 16, 23	10 2,11 8	4 20 2 W			10 6,11 4	29472	25		JWG
Rio Claro	10 18 0 N	298 50	Feb 8, 23	12 8,14 2	4 31 1 W	11 2,11 5	41 36 6 N	13 2,13 8	29378	28	EI 28	JTH
San Fernando, *A*	10 16 8 N	298 33	Jan 19, 23	13 4,15 0	4 21 6 W	15 8,16 0	41 42 2 N	13 7,14 5	29380	25	EI 25	JWG
San Fernando, *B*	10 16 8 N	298 33	Jan 19 23	14 4,16 4	4 19 5 W			14 9,15 9	29370	28		JTH
Cedros	10 05 3 N	298 07	Feb 27, 23	13 0 to 17 5(10)	4 06 5 W			16 9	29269	28		JTH
			Feb 28, 23	9 2	4 04 7 W					28		JTH

ISLANDS, INDIAN OCEAN

CEYLON

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Colombo, *A*	6 54 2 N	79 52	Oct 9 '21	14 0,15 2	2 34 6 W	16 7	4 12 4 S	14 3,15 0	38392	13	177 2X(78)	FB
Colombo, *C*	6 54 2 N	79 52	Oct 10, 21	8 8, 9 6	2 35 2 W	14 6	4 16 4 S	9 2	38446	13	177 2X(78)	FB

COMORO ISLANDS

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Dzaoudzi	12 47 2 S	45 17	Jul 6, '21	11 2	6 11 6 W	13 2	46 09 2 S	11 5	25687	13	177 2X	FB

MADAGASCAR

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Diego-Suarez	12 16 4 S	49 16	May 16, '21			17 2	44 11 4 S				177 2X(78)	FB
			May 17, 21	6 3, 7 6	4 02 3 W			6 7, 7 3	25680	13		FB
Boubavato	12 29 7 S	49 27	May 15, 21	14 1	4 52 4 W	12 6	44 49 4 S	14 4	25364	13	177 2X	FB
Ampasimbaria	12 47 8 S	49 39	May 14, 21	6 7, 7 0 8 2	5 06 2 W	9 6	45 01 8 S	7 3, 7 9	25480	13	177 2X(78)	FB
Vohemar	13 21 2 S	49 59	May 11, 21	7 5,15 2	6 32 8 W	16 7	45 55 2 S	8 0,14 9	24702	13	177 2X(78)	FB
Nosi Be *	13 24 2 S	48 18	May 18 21	13 2,14 5	1 20 4 E	16 1	45 03 6 S	13 5,14 2	25316	13	177 2X(78)	FB
Anjala	13 52 8 S	50 06	May 9, 21	12 8,13 6	5 35 4 W	10 8	45 44 2 S	13 1	25077	13	177 2X(78)	FB
Sambava	14 15 5 S	50 08	May 7, 21	15 0,16 2	6 18 6 W	17 2	45 51 7 S	15 3,15 9	25392	13	177 2X(78)	FB
Andempona	14 35 6 S	50 10	May 6 21	13 3	5 37 7 W	11 2	47 13 8 S	13 6	24795	13	177 2X	FB
Analalava	14 38 0 S	47 45	May 19, 21	14 0,14 8	6 03 6 W	13 1	47 34 2 S	14 4	24242	13	177 2X(78)	FB
Antalaha	14 53 6 S	50 15	May 5, 21	6 5, 7 9	6 22 0 W	10 1	47 27 3 S	6 8, 7 6	24879	13	177 2X(78)	FB
Manakabahiny	15 14 2 S	50 03	May 2, 21			17 6	48 07 2 S				177 2X(78)	FB
			May 3, 21	6 4, 7 8	6 12 6 W			6 7, 7 5	24172	13		FB
Maroantsetra	15 26 2 S	49 43	May 1, 21	6 8, 8 0	6 50 2 W	9 2	48 52 6 S	7 1, 7 7	23850	13	177 2X(78)	FB
Rantabe	15 42 3 S	49 38	Apr 29, 21	9 2 11 7	5 47 2 W	13 4	48 37 2 S	9 6,11 4	23868	13	177 2X(78)	FB
Majunga, *B*	15 43 4 S	46 19	Jun 30, 21	12 7,14 0	6 35 5 W	9 8	49 50 5 S	13 0,13 7	23349	13	177 2X(78)	FB
			Jul 1, 21	5 8 to 18 2 (dv)	6 35 6 W					13		FB
Andronadrona	15 45 9 S	49 12	Apr 27, 21	10 5	6 39 3 W	13 2	49 09 8 S	10 9	23670	13	177 2X(78)	FB
Mandritsara	15 50 8 S	48 49	Apr 25, 21	8 3 9 6	6 00 5 W	11 3	49 31 3 S	8 6, 9 3	23268	13	177 2X(78)	FB

* Local disturbance

ISLANDS, INDIAN OCEAN

MADAGASCAR—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Pointe Sada	15 59 4 S	45 21	Jun 26, '21	13 5,14 8	6 24 6 W	16 2	50 06 2 S	13 9,14 5	23086	13	177 2X(78)	FB
Andranokelilalina	16 20 8 S	48 50	Apr 22, 21	12 6,14 0	6 30 8 W	15 7	49 58 1 S	12 9,13 7	23330	13	177 2X(78)	FB
Ambodivelatra	16 39 3 S	48 39	Apr 21, 21	6 7, 8 1	6 58 4 W	9 3	50 23 7 S	7 0, 7 8	23062	13	177 2X(78)	FB
Marofotsy	16 43 5 S	44 27	Jun 24, 21	7 3, 8 6	7 23 2 W	10 4	51 17 2 S	7 7, 8 4	22504	13	177 2X(78)	FB
Andilamena	17 00 9 S	48 34	Apr 19, 21	10 6,12 4	6 42 3 W	16 6	50 57 2 S	10 9,11 6	22803	13	177 2X(78)	FB
Fenerive	17 22 4 S	49 23	Sep 21, 21	8 6	0 38 1 E	7 9	52 52 3 S	9 4	22180	Br[1]	Brunner[1]	EC
Imerimandroso	17 25 9 S	48 34	Apr 17, 21	12 6,13 9	3 43 4 W	16 0	53 01 6 S	12 9,13 6	22694	13	177 2X(78)	FB
Ambatondrazaka	17 49 4 S	48 24	Apr 14, 21	7 9, 9 3	7 14 0 W	10 9	51 45 5 S	8 2, 9 0	22334	13	177 2X(78)	FB
			Apr 15, 21	5 9 to 18 2 (dv)	7 11 4 W					13		FB
Maintirano, *A*	18 03 8 S	44 03	Jun 20, 21	9 5,11 1	7 31 4 W	15 2	53 03 0 S	10 0,10 8	21756	13	177 2X(78)	FB
Tamatave	18 09 6 S	49 24	Sep 15, 21			10 2	51 45 6 S				Brunner[1]	EC
			Sep 16, 21	9 4	7 14 1 W			9 4	22275	Br[1]		EC
			Sep 24, 21	15 5	6 50 8 W					Br[1]		EC
			Sep 29, 21	7 4	7 04 9 W					Br[1]		EC
Maintirano, *B*	18 10 4 S	44 03	Jun 21, 21	10 3,11 1,14 6	7 34 7 W	13 8	52 48 6 S	11 4	21941	13	177 2X(78)	FB
Ankatoky	18 11 1 S	44 07	Jun 18, 21			11 6	53 09 1 S				177 14X	FB
Tondrolo	18 30 9 S	44 14	Jun 17, 21	12 3	(8 10 W)	12 7	53 34 7 S			*177*	177 2X	FB
Moramanga, *B*	18 56 8 S	48 14	Apr 11, 21	8 5,10 0	8 15 8 W	11 5	53 09 2 S	8 8, 9 6	21594	13	177 2X(78)	FB
Andevorante	18 57 0 S	49 05	Mar 21, 21	6 8, 8 3	11 08 0 W	10 5	53 01 7 S	7 2, 8 0	22016	13	177 2X(78)	FB
Moramanga, *A*	18 57 1 S	48 12	Apr 10, 21	6 9, 8 6	8 35 6 W	10 7	53 25 3 S	7 3, 8 2	21360	13	177 2X(8)	FB
Benjavilo	19 00 0 S	44 13	Jun 15, 21	6 0 to 14 1 (dv)	8 17 2 W	16 9	53 58 8 S	14 9,15 6	21209	13	177 2X(78)	FB
			Jun 15, 21	14 5,15 9	8 13 4 W					13		FB
Ankororiky	19 12 9 S	44 26	Jun 13 21	10 1,10 9	8 25 4 W	13 0	54 13 1 S	10 4	21130	13	177 2X	FB
Vatomandry	19 20 2 S	48 57	Mar 19, 21	9 3,10 6	4 29 4 W	13 8	57 24 0 S	9 6,10 3	20824	13	177 2X(78)	FB
Belo	19 42 2 S	44 32	Jun 11, 21	10 6,15 6	8 31 2 W	16 6	54 43 8 S	11 2,15 2	20895	13	177 2X(7)	FB
Mahanoro	19 53 8 S	48 47	Mar 15, 21	14 8,16 1	9 18 0 W			15 2,15 8	21588	13		FB
			Mar 16, 21	6 1 to 18 1 (dv)	9 17 7 W					13		FB
			Mar 17, 21			8 0	53 42 9 S				177 2X(78)	FB
Ambinanindrano	20 05 2 S	48 19	Mar 13, 21	12 7,14 1	9 52 8 W	15 4	53 24 4 S	13 1,13 8	21724	13	177 2X(78)	FB
Morondava, *A*	20 17 4 S	44 15	Jun 8, 21	6 7, 8 4	9 13 0 W	10 3	56 17 7 S	7 1, 8 1	20302	13	177 2X(78)	FB
Morondava, *B*	20 17 7 S	44 15	Jun 8, 21	16 3,17 0	9 27 0 W	15 2	56 16 8 S	16 6	20297	13	177 2X	FB
Mahabo	20 23 1 S	44 38	Jun 5, 21			15 9	55 27 7 S				177 2X(78)	FB
			Jun 6, 21	6 9, 8 2	8 55 2 W			7 3, 7 9	20506	13		FB
Soavina	20 23 5 S	48 15	Mar 11, 21	10 4,11 3	11 26 8 W	13 4	54 00 5 S	10 8	21674	13	177 2X	FB
Nosivarika	20 34 3 S	48 30	Mar 9, 21			17 9	55 56 0 S				177 2X	FB
			Mar 10, 21	6 4, 7 9	6 59 2 W			6 8, 7 6	20562	13		FB
Mandabe	21 03 7 S	44 56	Jun 1, 21	10 2,11 6	9 30 4 W	16 1	56 01 2 S	10 6,11 3	20266	13	177 2X(78)	FB
			Jun 2, 21	5 7 to 18 1(dv)	9 28 6 W					13		FB
Mananjary	21 14 5 S	48 19	Mar 3, 21	9 6,11 0	9 01 3 W	16 5	56 40 2 S	10 0,10 7	20473	13	177 2X(78)	FB
			Mar 4, 21	6 0 to 18 1(dv)	8 57 5 W					13		FB
Ambohibe	21 21 1 S	43 31	May 26, 21	8 8,10 2	9 45 8 W	13 4	56 38 5 S	9 2, 9 9	19913	13	177 2X(78)	FB
Anosibe	21 24 2 S	43 41	May 27 21			17 0	56 40 1 S				177 2X(78)	FB
			May 28, 21	6 8	9 44 1 W			6 6	19917	13		FB
Manja	21 27 7 S	44 20	May 29, 21	14 6,16 0	9 34 4 W			14 9,15 7	19953	13		FB
			May 30, 21			7 4	56 32 1 S				177 2X(78)	FB
Ambinany-Faraony	21 48 4 S	48 10	Feb 27, 21	9 4 10 8	10 04 6 W	14 5	57 21 4 S	9 8,10 5	20370	13	177 2X(78)	FB
Manakara	22 08 6 S	48 02	Feb 25, 21	8 6, 9 5	11 39 2 W	10 9	57 11 7 S	9 0	19865	13	177 2X(78)	FB
Mangatsiotra	22 18 2 S	47 57	Feb 24, 21	12 8	11 48 1 W	15 7	56 02 6 S	13 2	20664	13	177 2X	FB
Farafangana	22 49 4 S	47 49	Feb 21, 21	10 7,14 3	13 41 6 W	16 0	57 17 4 S	11 1,11 8	20554	13	177 2X(78)	FB
Vangaindrano	23 20 8 S	47 35	Feb 18, 21	6 5, 8 0	15 23 0 W	9 7	56 29 1 S	6 9, 7 7	20038	13	177 2X(78)	FB
Manambondro	23 49 7 S	47 31	Feb 15, 21	15 3,16 8	14 46 2 W	18 3	57 11 6 S	15 8,16 5	20452	13	177 2X(78)[2]	FB
Beholoka	23 54 5 S	43 40	Jan 11, 21	9 4,10 8	11 17 6 W	13 9	58 40 1 S	9 8,10 5	18862	13	177 2X(78)	FB
Manantenina	24 16 6 S	47 18	Feb 13, 21	6 6, 8 2	12 23 8 W	14 3	58 09 9 S	7 0, 7 8	19158	13	177 2X(78)	FB
Iabako	24 37 1 S	47 10	Feb 11, 21	15 7,17 0	11 52 3 W	18 3	58 24 5 S	16 0,16 7	18988	13	177 2X(78)	FB
Itampolo	24 40 8 S	43 55	Jan 14, 21	7 9, 9 3	11 55 5 W	11 4	59 22 0 S	8 3, 9 0	18636	13	177 2X(78)	FB
Ampanihy	24 41 2 S	44 43	Jan 21, 21	6 7, 8 3	11 46 4 W	14 0	59 16 6 S	7 0, 7 8	18658	13	177 2X(78)	FB
Tsimilofo	24 59 4 S	45 09	Jan 23, 21	15 3,16 6	11 42 2 W	18 3	59 19 5 S	15 7 16 3	18556	13	177 2X(78)	FB
Bevilany	25 00 4 S	46 33	Feb 3, 21	15 0,16 3	11 47 4 W	17 8	59 05 8 S	15 3,16 0	18667	13	177 2X(78)	FB
Androka	25 01 7 S	44 04	Jan 15, 21	17 0,18 4	11 53 1 W			17 3,18 1	18323	13		FB
			Jan 16, 21	5 8 to 18 1(dv)	11 54 1 W					13		FB
			Jan 17, 21			17 6	59 55 5 S				177 2X(78)	FB
Fort Dauphin	25 02 1 S	46 58	Feb 8, 21	7 6, 9 2	12 01 4 W	10 9	59 04 0 S	8 0, 8 8	18716	13	177 2X(78)	FB
Ambovombe	25 10 6 S	46 02	Jan 31, 21	15 8,17 3	10 19 6 W			16 1,16 9	18306	13		FB
			Feb 1, 21	5 8 to 18 1(dv)	10 24 0 W					13		FB
			Feb 2, 21			6 7	60 18 0 S				177 2X(78)	FB
Tsihombe	25 19 1 S	45 27	Jan 29, 21	7 1, 8 5	13 10 2 W	10 5	59 19 4 S	7 5, 8 2	18424	13	177 2X(78)	FB
Faux Cap	25 34 0 S	45 30	Jan 27, 21	9 8,11 2	11 57 9 W	14 9	60 50 2 S	10 2,10 9	17890	13	177 2X(78)	FB
Cap Sainte Marie	25 37 1 S	45 08	Jan 25, 21	14 1,15 0	11 40 0 W	17 0	59 31 1 S	14 5	18334	13	177 2X(78)	FB

ZANZIBAR

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Zanzibar	6 10 1 S	39 11	Jul 10, '21	7 2, 8 6	4 21 4 W	10 6	35 30 2 S	7 6, 8 3	28474	13	177 2X(78)	FB

[1] Brunner magnetometer and dip circle of the Tananarive Observatory

[2] 15X rejected

ISLANDS, MEDITERRANEAN

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Naxos	37 06 4 N	25 23	Jul 14, '22	7 8, 9 4	2 16 5 W	9 9,10 0	51 22 6 N	8 2, 9 0	26408	12	EI 7	PHD
Rhodes	36 26 6 N	28 12	Aug 1, 22	6 1 to 18 3(dv)	1 28 1 W					12		PHD
			Aug 2, 22	10 8,15 0	1 28 0 W	7 8, 8 1	50 39 8 N	9 5,10 4	26770	12	EI 7	PHD
			Aug 2, 22			12 9,13 2	50 38 5 N	13 8,14 6	26798	12	EI 7	PHD
Candia (Crete)	35 19 3 N	25 09	Jul 19, 22	8 8,10 5	2 35 8 W	11 2,11 4	49 12 3 N	9 3,10 2	27192	12	EI 7	PHD
			Jul 20, 22	6 0 to 18 0(dv)	2 35 0 W			6 2 to 17 9 (dv)	27205	12		PHD
			Jul 21, 22			6 0 to 17 6 (dv)	49 12 6 N				EI 7	PHD
Larnaka (Cyprus)	34 53 7 N	33 38	Aug 7, 22	10 2,11 9	0 06 8 E	13 3,13 5	48 53 8 N	10 7,11 6	28298	12	EI 7	PHD

ISLANDS, PACIFIC OCEAN

BISMARCK ARCHIPELAGO

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	Hor Int. LMT	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Rabaul	4 12 7 S	152 12	Dec 5, '21	10 1,11 7	6 10 4 E	14 1,14 3	19 42 4 S	10 6,11 4	36386	24	EI 24	DGC
			Dec 8, 21	10 5,14 6	6 10 0 E	9 2, 9 4	19 42 8 S	10 9,15 0	36380	24	EI 24	DGC

COOK ISLANDS

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	Hor Int. LMT	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Avarua (Tekeu), *B**	21 11 4 S	200 15	Jul 17, '22	10 6,12 7	11 55 1 E	13 8,14 0	38 57 4 S	11 0,12 1	32700	24	EI 24	DGC
Avarua (Coral Beach), *C**	21 11 4 S	200 15	Jul 10, 22			10 8,11 1	38 34 4 S				EI 24	DGC
			Jul 10, 22			13 4,13 6	38 34 8 S				EI 24	DGC
			Jul 12, 22	10 0,11 8	12 33 4 E			10 5,11 4	32879	24		DGC
			Jul 13, 22	8 7,10 4	12 35 0 E			9 2,10 0	32883	24		DGC
			Jul 13, 22	15 4,17 0	12 36 0 E			15 8,16 6	32848	24		DGC
			Jul 15, 22	7 0 to 18 0(dv)	12 35 3 E					24		DGC
Avarua* (Range Lights)	21 11 5 S	200 15	Apr 16, 22	12 4,14 0	11 56 2 E	11 5,11 7	38 58 6 S	12 9,13 7	32726	24	EI 24	DGC
			Jun 19, 22	10 4,10 6	11 56 1 E	11 1,11 3	38 57 6 S	14 2,15 1	32688	24	EI 24	DGC
			Jun 20, 22	6 7 to 17 0(dv)	11 58 0 E				,	24		DGC
			Jun 21, 22			6 9 to 17 1 (dv)	38 58 2 S				EI 24	DGC
			Jun 22, 22	6 8,17 2	11 58 8 E			7 2 to 17 1 (dv)	32679	24		DGC
			Jun 22, 22	7 2 to 17 1(dv)	11 57 7 E					24		DGC
			Jun 27, 22	6 9 to 18 0(dv)	11 59 5 E					24		DGC
			Jun 30, 22			5 8 to 17 4 (dv)	39 00 1 S				EI 24	DGC
			Jul 3, 22	6 6,18 0	11 58 8 E			7 0 to 17 7 (dv)	32698	24		DGC
			Jul 3, 22	7 0 to 17 7(dv)	11 56 7 E					24		DGC

ELLICE ISLANDS

Station	Latitude	Long East of Gr	Date	Decl. LMT	Decl. Value	Incl. LMT	Incl. Value	Hor Int. LMT	Hor Int. Value	Mag'r	Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Nanomea Island	5 40 4 S	176 08	Sep 14, '21	11 1,13 8	9 18 0 E	14 5,14 7	16 34 2 S	11 5,13 4	35932	24	EI 24	DGC
Niutao Island	6 06 6 S	177 21	Sep 15, 21	13 1,14 9	9 02 7 E	11 1,11 3	15 45 5 S	13 6,14 5	36487	24	EI 24	DGC
Nanomana Island	6 17 6 S	176 20	Sep 13, 21	10 6,12 6	8 58 6 E	14 3,14 6	17 00 4 S	11 1,12 1	36380	24	EI 24	DGC
Nui Island	7 15 0 S	177 10	Sep 9, 21	13 8,15 2	9 16 1 E			14 2,15 0	36092	24		DGC
			Sep 12, 21	11 5,11 7	9 22 2 E	10 6,10 9	19 04 2 S			24	EI 24	DGC
Vaitupu Island	7 29 2 S	178 41	Sep 8, 21	10 2,13 1	9 09 2 E	14 0,14 3	19 02 6 S	10 7,11 6	36154	24	EI 24	DGC
Nukufetau Island	8 01 7 S	178 20	Sep 7, 21	10 2,13 4	9 16 7 E	14 2,14 4	20 20 2 S	10 8,13 0	36202	24	EI 24	DGC
Funafuti Island, *B*	8 31 2 S	179 11	Sep 6, 21	13 3,16 2	9 15 3 E			13 8,15 8	35338	24		DGC
			Sep 17, 21			9 7,10 2	21 14 9 S				EI 24	DGC
Funafuti Island, *A*	8 31 5 S	179 11	Sep 16, 21	13 5,15 2	9 15 7 E					24		DGC
			Sep 17, 21			12 8,13 0	21 06 6 S	14 0,14 8	35350	24	EI 24	DGC
Nukulailai	9 22 1 S	179 50	Sep 19, 21	10 8,14 0	8 51 4 E	10 2,10 4	22 27 8 S	11 2,13 6	36380	24	EI 24	DGC

* Local disturbance

ISLANDS, PACIFIC OCEAN

FIJI ISLANDS

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Lautoka	17 36 6 S	177 26	Oct 8, '21	7 6, 9 2	9 57 8 E	10 4,10 6	38 01 0 S	8 0, 8 9	34784	24	EI 24	DGC
Suva, *Dr Klotz's Station*	18 08 4 S	178 26	Oct 5, 21	14 5,16 1	10 38 6 E	16 7,17 0	38 26 6 S	14 9,15 7	34864	24	EI 24	DGC

HAWAIIAN ISLANDS

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Sisal, Honolulu Magnetic Observatory, *Pier A*	21 19 2 N	201 56	Apr 18, '21					11 0,12 0	28884	5		C VI
			Apr 18, 21					15 2,16 0	28868	5		C VI
			Apr 19, 21	8 7, 8 9, 9 4	9 56 3 E			14 4,15 2	28820	5		C VI
			Apr 19, 21	9 6,10 1,10 2	9 53 1 E					5		C VI
			Apr 21, 21			9 4,10 3	39 24 5 N				EI 25	C VI
			Apr 21, 21			10 8,14 0	39 24 2 N				EI 25	C VI
			Apr 21, 21			14 4,15 1	39 25 7 N				EI 25	C VI
			Apr 22, 21			9 1, 9 3	39 25 7 N	10 4,11 0	28810	5	EI 25	C VI
			Apr 22, 21			9 4, 9 6	39 25 4 N				EI 25	C VI
			Apr 22, 21			9 8,10 0	39 25 0 N				EI 25	C VI
			Apr 22, 21			11 6	39 25 5 N				EI 25	C VI
			Apr 23, 21			9 7, 9 9	39 25 6 N				EI 25	C VI
			Apr 23, 21			11 0,11 2	39 24 4 N				EI 25	C VI
Sisal, *A*	21 19 2 N	201 56	Apr 15, 21					9 4,10 4	28790	5		C VI
			Apr 15, 21					13 9,14 8	28806	5		C VI
			Apr 20, 21	7 9, 8 1, 8 6	10 00 5 E	13 3,14 4	39 26 3 N			5	EI 25	C VI
			Apr 20, 21	8 8, 9 2	9 59 8 E	14 9,15 3	39 28 2 N			5	EI 25	C VI
			Apr 20, 21			15 8,16 3	39 28 6 N				EI 25	C VI
			Apr 20, 21			16 8,17 2	39 29 0 N				EI 25	C VI
			Apr 21, 21	8 2	9 59 2 E					5		C VI
			Apr 25, 21					8 6, 9 5	28832	5		C VI
			Apr 25, 21					15 0,15 9	28808	5		C VI

LORD HOWE ISLANDS

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Lord Howe Island	31 31 S	159 04	Jan 12, '23	6 9, 7 7	12 18 7 E	7 3, 7 4	59 18 8 S	7 9	28453	24	EI 24	DGC

MALAY ARCHIPELAGO[1]

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Kudat	6 53 3 N	116 50	Dec 9, '23			15 1,15 3	2 19 0 S	15 6	39365	24	EI 24	DGC
Jesselton	5 58 4 N	116 09	Dec 6, 23	9 6,11 0	1 58 8 E	9 0, 9 2	4 27 0 S	9 9,10 6	39399	24	EI 24	DGC
			Dec 10, 23	14 4,15 7	2 00 3 E	16 0,16 2	4 28 8 S	14 7,15 9	39366	24	EI 24	DGC
Sandakan	5 51 7 N	118 25	Dec 8, 23	8 7,10 0	2 03 0 E	10 4,10 6	4 13 5 S	9 0, 9 7	39283	24	EI 24	DGC
Labuan	5 16 5 N	115 17	Dec 11, 23	14 9,16 2	2 00 4 E	16 5,16 7	6 09 4 S	15 2,15 8	39362	24	EI 24	DGC
			Dec 12, 23	7 0, 7 1	1 57 4 E	10 5,10 7	6 09 6 S	9 1, 9 8	39400	24	EI 24	DGC
			Dec 12, 23	8 9,10 1	1 58 8 E					24		DGC
Bandjermasin	3 19 7 S	114 35	Nov 16, 23	9 2, 10 4	2 06 6 E	8 7, 8 9	24 46 2 S	9 5,10 2	38046	24	EI 24	DGC
			Nov 17, 23	8 0, 9 4	2 05 6 E			9 1	38027	24		DGC
Makassar	5 08 0 S	119 25	Nov 8, 23	12 4,14 1,15 3	2 27 8 E			14 4,15 0	37789	24		DGC
			Nov 9, 23	8 0, 9 1	2 24 2 E	7 5, 7 7	27 07 2 S	8 3, 8 9	37780	24	EI 24	DGC
			Nov 9, 23			11 3,11 5	27 04 5 S				EI 24	DGC
Weltevreden (Batavia), *A*	6 11 0 S	106 50	Oct 29, 23					21 4,22 3	36838	24		DGC
			Oct 29, 23					23 0,23 8	36848	24		DGC
			Oct 30, 23					0 7, 1 5	36874	24		DGC
			Nov 22, 23					23 4,24 2	36878	24		DGC
Weltevreden (Batavia), *C*	6 11 0 S	106 50	Oct 25, 23					20 0,21 0	36894	24		DGC
			Oct 26, 23					21 7,22 6	36882	24		DGC
			Oct 26, 23					23 4,24 2	36870	24		DGC
			Nov 23, 23					1 2, 1 9	36869	24		DGC
			Nov 23, 23					19 7,20 4	36866	24		DGC
Weltevreden (Batavia), *D*	6 11 0 S	106 50	Nov 22, 23	21 2 to 22 6 (6)	0 52 0 E					24		DGC

[1] The island of Java is included under this group instead of under the general heading, Islands, Indian Ocean, as in Volumes II and III of these Researches

ISLANDS, PACIFIC OCEAN

MALAY ARCHIPELAGO—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Weltevreden (Batavia), *E*	6 11 S	106 50	Oct 31, '23			22 8,23 0	32 05 0 S				EI 24	DGC
			Nov 1, 23			0 5 to 1 8 (4)	32 04 6 S				EI 24	DGC

MARQUESAS ISLANDS

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Puamau	9 46 6 S	221 07	May 20, '22	10 1,15 3	8 49 7 E			10 6,14 9	33826	24		DGC
Atuona	9 48 6 S	220 58	May 10, 22	8 0,10 9	11 58 8 E	15 4,15 7	21 43 4 S	8 8,10 6	32398	24	EI 24	DGC
			May 12, 22	6 5 to 17 8 (dv)	12 08 4 E					24		DGC

NEW CALEDONIA (INCLUDING LOYALTY ISLANDS)

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Paagoumene	20 29 2 S	164 11	Dec 4, '22	15 1,16 6	9 22 7 E	14 3,14 6	45 48 0 S	15 4,16 3	33623	24	EI 24	DGC
			Dec 5, 22	7 5, 9 0	9 16 4 E	9 4, 9 6	45 49 6 S	7 8, 9 2	33648	24	EI 24	DGC
Lifu Island (Keppanie)	20 46 8 S	167 09	Nov 17, 22	9 5,11 0	9 55 7 E	15 4,15 6	45 31 5 S	9 9,10 7	33604	24	EI 24	DGC
			Nov 18, 22	5 8 to 18 0 (dv)	9 57 5 E					24		DGC
			Nov 20, 22	5 4 to 17 5 (dv)	9 58 0 E			6 0 to 17 0 (dv)	33606	24		DGC
			Nov 21, 22			7 1 to 17 6 (dv)	45 31 1 S				EI 24	DGC
Maré Island (Tatyn)	21 32 6 S	167 53	Nov 15, 22			15 9,16 1	47 02 8 S	14 5,15 2	32737	24	EI 24	DGC
Bourail	21 37 S	165 29	Dec 9, 22	12 6,14 0	9 59 6 E	11 8,12 1	46 43 2 S	13 0,13 7	33412	24	EI 24	DGC
Noumea	22 16 3 S	166 28	Nov 28, 22	14 0,15 6	10 30 8 E	13 2,13 4	47 23 0 S	14 4,15 2	33196	24	EI 24	DGC
			Nov 29, 22	7 1, 9 8	10 24 9 E	10 3,10 6	47 19 0 S	7 5, 9 4	33226	24	EI 24	DGC
			Nov 30, 22	7 9, 9 3	10 25 3 E	7 4, 7 5	47 23 0 S	8 2, 9 0	33184	24	EI 24	DGC

NEW GUINEA

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Mambare	8 04 3 S	148 01	Jan 2, '22	14 4,15 8	5 21 8 E	16 3,16 6	28 43 9 S	14 8,15 4	36846	24	EI 24	DGC
Tamata Junction	8 22 1 S	147 50	Jan 1, 22	9 1,10 9	5 17 3 E	15 9,16 1	29 04 7 S	9 5,10 5	36720	21	EI 24	DGC
Buna Bay	8 40 3 S	148 25	Jan 4, 22	7 3, 8 8	5 27 0 E	9 3, 9 5	29 32 4 S	7 7, 8 5	36622	24	EI 24	DGC
Cape Nelson	9 03 3 S	149 17	Jan 6, 22	12 4,14 7	6 24 8 E	15 2,15 4	29 47 7 S			24	EI 24	DGC
Ipoteto Island	9 38 0 S	150 01	Jan 7, 22			17 4,17 6	31 13 5 S				EI 24	DGC
Kwato Island	10 37 3 S	150 38	Dec 24, 21	12 5,14 2	4 48 0 E	11 2,11 5	32 40 6 S	13 1,13 8	36693	24	EI 24	DGC
Samarai, *B*	10 37 3 S	150 40	Dec 22, 21	14 5,16 2	8 40 0 E	16 7,16 9	32 44 0 S	15 0,15 8	37152	24	EI 24	DGC
Samarai, *A*	10 37 4 S	150 40	Dec 16, 21	15 2,16 8	8 35 1 E			15 6,16 5	38016	24		DGC
			Dec 17, 21			9 6, 9 9	33 12 4 S				EI 24	DGC
Suau Island	10 42 2 S	150 15	Dec 20, 21	10 2,11 7	5 21 1 E	13 0,13 2	33 14 6 S	10 6,11 4	36598	24	EI 24	DGC

NEW HEBRIDES

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Hog Harbor	15 09 S	167 07	Jan 1, '23			14 6,14 8	37 10 6 S	15 4,16 1	35122	24	EI 24	DGC
Luganville	15 32 S	167 09	Dec 20, 22	9 6,10 4,15 4	8 52 8 E	15 9,16 0	37 29 8 S	11 2,15 1	35319	24	EI 24	DGC
Ringdove	16 38 S	168 10	Dec 19, 22	14 2,15 2	11 19 3 E	15 8,16 0	40 06 6 S	14 6	33974	24	EI 24	DGC
Fila	17 44 3 S	168 19	Dec 23, 22	13 9,15 6	9 40 6 E	10 8,11 0	40 31 0 S	14 4,15 2	34732	24	EI 24	DGC
			Dec 26, 22	8 7,10 3	9 36 6 E	15 8,16 0	40 34 4 S	9 1,10 0	34767	24	EI 24	DGC
			Dec 27, 22	7 1, 8 7	9 35 0 E	9 1, 9 3	40 34 2 S	7 6, 8 4	34738	24	EI 24	DGC
			Dec 28, 22	14 8,16 2	9 41 0 E	14 3,14 5	40 32 7 S	15 2,15 9	34728	24	EI 24	DGC

SAMOA ISLANDS

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Apia, Samoa Observatory, *A*	13 48 4 S	188 14	Jul 1, '21					10 9,11 8	35264	5		C VI
			Jul 1, 21					14 4,15 4	35244	5		C VI
			Jul 2, 21					10 6,11 6	35259	5		C VI
			Jul 5, 21	9 8 to 11 6 (6)	10 11 8 E					5		C VI

ISLANDS, PACIFIC OCEAN

SAMOA ISLANDS—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Apia, Samoa Observatory, *A—Concluded*	13 48 4 S	188 14	Jul 6, '21					10 2,11 0	35296	24		DGC
			Jul 6, 21					13 2,14 0	35282	24		DGC
			Jul 6, 21					14 8	35246	24		DGC
			Jul 7, 21					9 8,10 6	35257	24		DGC
			Jul 12, 21					9 6,10 7	35259	25		C VI
			Jul 12, 21					11 7	35243	25		C VI
			Jul 13, 21					7 8, 9 0	35226	25		C VI
			Jul 13, 21					10 1	35236	25		C VI
			Jul 13, 21					11 6,12 2	35216	5		C VI
			Jul 13, 21					13 8	35245	5		C VI
			Jul 15, 21	8 1, 8 2, 8 6	10 12 9 E					24		DGC
			Jul 15, 21	8 8, 9 2, 9 3	10 12 3 E					24		DGC
			Jul 15, 21	15 7,17 4	10 13 6 E					24		DGC
			Jul 15, 21	15 8 to 17 4 (dv)	10 13 8 E					24		DGC
			Jul 16, 21			10 6,11 6	30 01 6 S				EI 25	C VI
			Jul 18, 21	10 0,10 1,10 9	10 12 1 E	14 4,14 8	30 00 8 S			25	EI 25	C VI
			Jul 18, 21	11 1,11 6,11 8	10 12 5 E	15 4,15 8	30 01 4 S			25	EI 25	C VI
			Jul 19, 21			10 4 (3)	30 00 0 S				EI 25	C VI
			Jul 19, 21			13 3,13 6	30 00 2 S				EI 24	DGC
			Jul 19, 21			14 0,14 2	30 01 0 S				EI 24	DGC
			Jul 19, 21			14 7,15 0	30 01 0 S				EI 24	DGC
			Jul 20, 21			9 5 to 12 0 (6)	29 59 9 S				EI 25	C VI
Apia, Samoa Observatory, *B*	13 48 4 S	188 14	Jul 1, 21					14 4,15 4	35244	25		C VI
			Jul 2, 21					10 6,11 7	35245	25		C VI
			Jul 5, 21	9 8 to 11 6(6)	10 12 3 E					25		C VI
			Jul 7, 21					14 0,14 9	35216	24		DGC
			Jul 8, 21					9 8,10 8	35234	24		DGC
			Jul 8, 21					12 8,15 1	35246	24		DGC
			Jul 11, 21	10 0,10 3,10 8	10 12 2 E					24		DGC
			Jul 11, 21	11 0,11 6,11 8	10 11 3 E					24		DGC
			Jul 11, 21					14 4,15 6	35244	25		C VI
			Jul 12, 21					9 5,10 7	35228	5		C VI
			Jul 12, 21					11 7	35226	5		C VI
			Jul 13, 21					7 7, 9 0	35220	5		C VI
			Jul 13, 21					10 1	35226	5		C VI
			Jul 13, 21					12 2,13 8	35222	25		C VI
			Jul 15, 21	10 2,10 4,10 9	10 12 0 E					24		DGC
			Jul 15, 21	11 1,11 5,11 7	10 12 9 E					24		DGC
			Jul 16, 21			10 7,11 6	30 06 2 S				EI 24	DGC
			Jul 18, 21	10 0 to 11 8(6)	10 12 5 E					5		C VI
			Jul 18, 21			14 4,14 9	30 03 8 S				EI 24	DGC
			Jul 18, 21			15 4,15 8	30 04 6 S				EI 24	DGC
			Jul 19, 21			9 8,10 9	30 03 6 S				EI 24	DGC
			Jul 19, 21			11 8 to 15 0 (7)	30 02 8 S				EI 25	C VI
			Jul 20, 21			14 9 to 17 1 (6)	30 03 5 S				EI 7	C VI
Apia, Samoa Observatory, *N Pier*	13 48 4 S	188 14	Jul 7, 21					14 0,14 9	35278	5		C VI
			Jul 8, 21					9 8,10 8	35248	5		C VI
			Jul 8, 21					12 8,15 1	35260	5		C VI
			Jul 9, 21					9 7,11 0	35257	5		C VI
			Jul 11, 21	10 0 to 11 8(6)	10 08 7 E					5		C VI
			Jul 12, 21					9 6,10 8	35279	24		DGC
			Jul 12, 21					11 8	35298	24		DGC
			Jul 12, 21					14 3,15 6	35258	5		C VI
			Jul 13, 21					7 8, 9 1	35272	24		DGC
			Jul 13, 21					10 1	35280	24		DGC
			Jul 15, 21	10 2 to 11 7(6)	10 09 0 E					5		C VI
Apia, Samoa Observatory, *SE Pier*	13 48 4 S	188 14	Jul 20, 21			14 9 to 17 1 (6)	30 04 2 S				EI 25	C VI
Apia, Samoa Observatory, *West Pier*[1]	13 48 4 S	188 14	Jun 23, 21					14 9,15 6	35200	24		E&C
			Jun 24, 21	11 0,11 8	10 08 0 E			14 3,15 0	35212	24		E&C
			Jun 24, 21					15 8	35189	24		E&C
			Jun 25, 21	9 4, 9 7,11 2	10 10 1 E			10 1,10 8	35227	24		E&C
			Jun 25, 21					15 8,16 5	35232	24		E&C
			Jun 26, 21	9 0,10 4	10 09 8 E			9 3,10 0	35199	24		E&C
			Jun 28, 21	11 0,13 6	10 11 6 E			11 5,13 2	35209	24		DGC

[1] *West Pier* was examined before these observations and found to be magnetic

ISLANDS, PACIFIC OCEAN

SAMOA ISLANDS—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
Apia, Samoa Observatory, *West Pier*[2]—*Concluded*	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
	13 48 4 S	188 14	Jun 29, '21	10 8,12 2	10 08 6 E			13 4	35158	24		DGC
			Jun 30, 21	10 9	10 10 4 E					24		DGC
			Jul 1, 21					10 8,12 1	35223	24		DGC
			Jul 1, 21					14 4,15 3	35223	24		DGC
			Jul 2, 21					10 6,11 6	35226	24		DGC
			Jul 5, 21	9 8,10 0,10 4	10 10 2 E					24		DGC
			Jul 5, 21	10 6,11 4,11 6	10 09 8 E					24		DGC
			Jul 6, 21					9 0 to 13 9 (5)	35244	5		C VI
			Jul 7, 21					9 8,10 1	35214	5		C VI
			Jul 7, 21					14 0	35221	25		C VI
			Jul 8, 21					9 8,10 8	35206	25		C VI
			Jul 8, 21					12 8,15 1	35212	25		C VI
			Jul 9, 21					9 7,11 0	35211	24		DGC
			Jul 11, 21	10 0 to 11 8(6)	10 09 0 E					25		C VI
			Jul 11, 21					14 4,15 5	35224	24		DGC
			Jul 12, 21					14 3,15 6	35218	24		DGC
			Jul 13, 21					11 6,13 8	35224	24		DGC
			Jul 15, 21	8 1 to 9 3 (6)	10 10 0 E					5		C VI
			Jul 18, 21	10 0,10 1,10 9	10 11 3 E					24		DGC
			Jul 18, 21	11 1,11 6,11 8	10 11 7 E					24		DGC
			Jul 20, 21					11 1,11 8	35218	24		DGC
Tau Island	14 13 S	190 28	Aug 23, 21	14 4,14 7	9 36 8 E	16 0,16 2	30 54 2 S			24	EI 24	DGC
			Aug 24, 21					7 8, 8 7	34474	24		DGC
Pago Pago	14 17 0 S	189 19	Aug 12, 21			14 3,14 8	29 14 0 S	10 8,11 9	36078	24	EI 24	DGC
			Aug 16, 21	7 6, 7 9	9 37 4 E	14 1,14 5	29 14 8 S	9 6,10 6	36038	24	EI 24	DGC

SOCIETY ISLANDS

	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
Point Fareute, *A**	17 31 5 S	210 26	Apr 24, '22	9 4,11 3	10 11 0 E	13 6,13 8	30 54 4 S	10 1,11 0	32377	24	EI 24	DGC
Point Fareute, *B*	17 31 5 S	210 26	Jun 12, 22			7 1 to 17 5 (dv)	30 55 8 S				EI 24	DGC
			Jun 13, 22	6 6, 7 5	10 15 9 E			7 0	32378	24		DGC
Papeete*	17 31 8 S	210 27	Apr 25, 22			10 6,10 8	30 05 0 S	13 6,14 4	33277	24	EI 24	DGC
Papeete, *Secondary**	17 31 8 S	210 27	Apr 25, 22	9 7, 9 9	8 23 9 E					24		DGC

SOLOMON ISLANDS

	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
Faisi Island	7 04 4 S	155 53	Nov 16, '21	9 7,11 5	6 56 0 E	14 1,14 3	25 11 0 S	10 2,11 2	36801	24	EI 24	DGC
Salicana Island	7 26 8 S	157 40	Nov 18, 21	10 4,14 3	7 04 2 E	9 6, 9 8	25 26 6 S	10 8,12 6	36392	24	EI 24	DGC
Binskin's Station	7 47 5 S	156 35	Nov 17, 21	8 0,10 1	7 16 3 E	11 4,11 6	26 32 2 S	8 5, 9 6	36543	24	EI 24	DGC
Gizo	8 06 0 S	156 51	Nov 15, 21					9 0,10 2	36656	24		DGC
			Nov 19, 21	9 8,11 7	7 00 1 E	8 6, 8 9	26 35 8 S	10 3,11 2	36662	24	EI 24	DGC
			Dec 1, 21	7 8, 8 0	6 57 2 E	9 1, 9 3	26 35 6 S			24	EI 24	DGC
Makambo	9 04 9 S	160 12	Nov 7, 21	10 7,14 5	7 41 6 E	15 4,15 7	28 00 5 S	12 1,14 0	36532	24	EI 24	DGC
Tulagi	9 06 6 S	160 11	Nov 23, 21	16 5,18 0	7 55 0 E	15 6,15 8	27 23 2 S	16 9,17 6	36632	24	EI 24	DGC
			Nov 25, 21	9 9,11 4	7 52 8 E	13 6 13 8	27 22 1 S	10 2,11 1	36655	24	EI 24	DGC
Aola	9 31 2 S	160 30	Nov 9, 21	12 9,13 0	7 26 0 E	10 9,11 2	28 34 6 S	13 3	36078	24	EI 24	DGC
Rere	9 33 4 S	160 39	Nov 10, 21	11 1,13 4	7 41 8 E	14 0,14 2	28 40 4 S	11 8,13 0	36144	24	EI 24	DGC

TOKELAU ISLANDS

	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
Atafu Island	8 32 2 S	187 29	Sep 21, '21			13 0,13 2	18 37 8 S	14 2,15 0	35356	24	EI 24	DGC
Fakaofu Island	9 23 0 S	188 45	Sep 22, 21	9 8,11 5	8 43 6 E	13 0,13 2	20 28 6 S	10 3,11,1	35303	24	EI 24	DGC
Swains Island	11 03 S	188 55	Sep 23, 21	8 8,10 2	9 12 5 E	10 8,11 0	25 49 6 S	9 2, 9 9	33990	24	EI 24	DGC

TONGA ISLANDS

	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
Neiafu	18 39 S	186 01	Sep 30, '21	14 1,16 0	10 47 4 E	13 2,13 4	37 58 6 S	14 6,15 6	34202	24	EI 24	DGC
Nukualofa	21 07 6 S	184 47	Oct 3, 21	10 8,11 6	11 18 2 E	14 0,14 2	41 46 8 S	11 9,13 1	33600	24	EI 24	DGC

*Local disturbance

ISLANDS, PACIFIC OCEAN

TUAMOTU ARCHIPELAGO

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
Puka Puka Island	14 48 S	221 10	May 25, '22	14 0,15 7	9 45 6 E			14 4,15 3	33080	24		DGC
			May 26, 22			8 0, 8 2	24 56 1 S				EI 24	DGC
Tikei Island	14 57 S	215 26	May 3, 22			10 6,10 8	26 38 4 S				EI 24	DGC
Angatau Island	15 49 4 S	219 07	May 31, 22	9 2,10 9	10 28 5 E	7 9, 8 1	26 47 0 S	9 6,10 5	32992	24	EI 24	DGC
Fakahina Island	15 57 8 S	219 51	May 29, 22	8 8,11 2	10 14 2 E	12 7,13 0	26 37 7 S	9 9,10 8	33105	24	EI 24	DGC

ARCTIC REGION

ARCTIC SEA

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 351	76 44 N	144 09	Jun 25, '24	16 8,17 3	1 30 E	10 6	84 32 3 N	10 6	05557	205	205 236	S&W
			Jun 25, 24	18 0	1 29 9 E					8		FM
No 352	76 43 N	144 06	Jun 26, 24	17 0	1 09 1 E					8		FM
No 350	76 41 N	145 08	Jun 23, 24	10 8	0 17 E					205		HUS
No 358	76 39 N	139 28	Jul 25, 24	9 4,11 2	1 16 E	10 5	84 44 3 N	10 5	05376	205	205 236	HUS
No 353	76 39 N	144 06	Jun 27, 24			10 2	84 28 9 N	10 2	05619	205	205 236	OW
No 357	76 38 N	140 38	Jul 21, 24	14 7,16 7	0 16 E	15 7	84 29 8 N	15 7	05626	205	205 236	HUS
No 359	76 36 N	139 00	Jul 30, 24	9 6,11 6,15 3	1 07 E	10 5	84 44 3 N	10 5	05384	205	205 236	S&W
No 355	76 34 N	144 00	Jun 30, 24			10 1	84 25 8 N	10 0	05668	205	205 236	OW
No 354	76 34 N	144 01	Jun 28, 24	17 4	1 26 4 E					8		FM
No 356	76 30 N	143 58	Jul 2, 24	17 1	1 04 7 E					8		FM
No 239	76 17 N	163 28	Sep 7, 23			9 9	83 36 5 N	9 8	06458	205	205 123	OW
No 238	76 16 N	163 28	Sep 6, 23	17 1	5 59 4 E					8		FM
No 234	76 12 N	163 58	Aug 30, 23			15 2	83 27 0 N	9 8,11 0	06564	8	205 123	S&W
			Aug 30, 23			16 7	83 28 1 N	15 2	06612	205	205 67(3)	OW
			Aug 30, 23					16 7	06602	205		OW
No 349	76 11 N	146 11	Jun 10, 24			10 4	84 07 0 N	10 4	05999	205	205 2367(3)	OW
No 348	76 09 N	149 30	Jun 5, 24			10 1	83 47 7 N	10 1	06337	205	205 236	OW
No 347	76 09 N	149 45	Jun 4, 24	17 6	0 17 E					205		FM
No 235	76 09 N	164 00	Aug 31, 23	16 7	3 34 4 E					8		FM
No 240	76 08 N	163 22	Sep 11, 23			10 0	83 43 0 N	10 0	06481	205	205 123	OW
			Sep 11, 23	17 2	7 23 1 E					8		FM
No 233	76 07 N	164 05	Aug 27, 23			10 8	83 23 0 N	10 8	06696	205	205 123	OW
No 346	76 06 N	150 26	Jun 3, 24	16 3	0 31 E	10 1	83 45 6 N	10 1	06350	205	205 236	S&W
			Jun 3, 24	17 6	0 40 9 E					8		FM
No 241*a*	76 06 N	163 19	Sep 12, 23	9 8	7 21 3 E					8		FM
No 241*b*	76 05 N	163 27	Sep 12, 23	17 1	5 52 7 E					8		FM
No 237	76 04 N	163 50	Sep 3, 23			10 2	83 13 0 N	10 2	06867	205	205 123	OW
No 236	76 04 N	164 02	Sep 1, 23	9 1	2 21 9 E					8		FM
			Sep 1, 23			10 3	83 16 2 N	10 3	06810	205	205 123	OW
No 345	76 02 N	150 49	Jun 2, 24	16 2	0 36 E					205		FM
No 242	76 01 N	163 26	Sep 14, 23			10 0	82 34 7 N	10 0	07629	205	205 12	OW
No 243	76 00 N	163 26	Sep 15, 23	9 8	4 48 9 E					8		FM
No 244	75 56 N	162 50	Sep 17, 23	9 0	5 19 6 E					8		FM
			Sep 17, 23			10 6	82 46 9 N	10 5	07325	205	205 123	OW
No 232	75 56 N	164 32	Aug 24, 23			10 1	83 01 0 N	10 1	07053	205	205 123	OW
No 230	75 55 N	164 51	Aug 21, 23	16 9	6 06 5 E					8		FM
No 344	75 54 N	152 27	May 19, 24	10 0	0 36 E					205		HUS
No 231	75 54 N	164 49	Aug 23, 23	17 1	6 12 6 E					8		FM
No 229	75 52 N	164 52	Aug 20, 23			10 2	82 57 3 N	10 2	07118	205	205 123	OW
			Aug 20, 23	16 9	6 22 4 E					8		FM
No 329	75 49 N	154 04	Apr 11, 24	16 7	3 04 7 E					8		FM
No 330	75 49 N	154 06	Apr 14, 24			10 0	83 41 8 N	10 0	06441	205	205 236	OW
			Apr 14, 24	16 8	3 41 9 E					8		FM
No 328	75 49 N	154 16	Apr 10, 24			10 5	83 47 7 N	10 5	06311	205	205 236	OW
No 335	75 48 N	154 01	Apr 23, 24	17 3	3 36 1 E					8		FM
No 336	75 48 N	154 02	Apr 24, 24			10 9	83 29 0 N	10 9	06651	205	205 263	OW
			Apr 24, 24			10 9	83 27 3 N	10 9	06683	205	205 17(3)	OW
No 333	75 48 N	154 03	Apr 18, 24	16 6	3 40 9 E					8		FM
No 337	75 48 N	154 03	Apr 25, 24	17 8	3 51 8 E			15 7,17 0	06779	8		S&M
No 339*a*	75 48 N	154 04	Apr 30, 24	17 9	3 45 8 E					8		FM
No 332	75 48 N	154 05	Apr 17, 24			10 5	83 27 9 N	10 6	06656	205	205 236	OW
No 331	75 48 N	154 07	Apr 16, 24	17 6	3 33 9 E					8		FM
No 334	75 48 N	154 07	Apr 21, 24			11 3	83 31 7 N	11 3	06616	205	205 236	OW
			Apr 21, 24	17 0	3 04 7 E					8		FM
No 338	75 48 N	154 08	Apr 28, 24			10 1	83 29 1 N	10 1	06667	205	205 236	OW
			Apr 28, 24	17 0	3 39 0 E					8		FM
No 327	75 48 N	154 42	Apr 9, 24	16 7	2 30 7 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	°		h h h	° ′	h h	° ′	h h	c g s			
No 326	75 48 N	155 02	Apr 8, '24	16 2	1 52 4 E					8		FM
No 228	75 47 N	165 04	Aug 15, 23	18 0	6 00 3 E					8		FM
No 343	75 46 N	153 53	May 15, 24	16 1	2 28 6 E					8		FM
No 341	75 46 N	153 54	May 12, 24	16 7	2 22 0 E					205		HUS
No 342	75 46 N	153 54	May 14, 24			10 2	83 39 5 N	10 2	06453	205	205 236	OW
No 245	75 46 N	162 54	Sep 21, 23	9 0	5 17 0 E					8		FM
			Sep 21, 23			10 3	82 44 0 N	10 3	07372	205	205 123	OW
No 227	75 46 N	165 18	Aug 14, 23			10 2	82 55 7 N	10 2	07141	205	205 123	OW
No 325	75 43 N	155 38	Apr 7, 24			9 8	83 05 8 N	9 8	07052	205	205 236	OW
			Apr 7, 24	16 2	2 21 1 E					8		FM
No 340	75 42 N	154 44	May 5, 24			14 8	82 56 3 N	14 8	07236	205	205 236	OW
No 226	75 38 N	166 29	Aug 6, 23			10 9	82 47 2 N	10 9	07269	205	205 123	OW
			Aug 6, 23	16 9	8 58 8 E					8		FM
No 225	75 38 N	166 38	Aug 3, 23			10 3	82 49 6 N	10 3	07232	205	205 123	OW
No 224	75 36 N	166 37	Aug 2, 23	17 6	9 20 8 E					8		FM
No 211	75 35 N	164 18	Jul 7, 23	9 7	5 53 4 E					8		FM
No 210	75 34 N	164 12	Jul 6, 23	17 9	5 33 E	10 2	82 42 9 N	10 2	07387	205	205 123	W&M
No 223	75 34 N	166 33	Aug 1, 23	17 9	8 40 3 E					8		FM
No 213	75 33 N	164 57	Jul 12, 23	17 1	5 57 6 E					8		FM
No 214	75 32 N	165 00	Jul 13, 23	18 1	6 39 E	11 2	82 43 4 N	11 1	07323	205	205 123	W&M
No 209	75 31 N	164 45	Jul 3, 23			10 4	82 40 9 N	10 4	07386	205	205 123	OW
			Jul 3, 23					15 6,16 9	07409	8		HUS
No 215	75 31 N	166 31	Jul 17, 23			10 4	82 47 4 N	10 4	07306	205	205 123	HUS
No 222	75 30 N	166 39	Jul 31, 23			11 1	82 45 3 N	11 1	07329	205	205 123	OW
			Jul 31, 23			11 1	82 45 2 N	11 1	07325	205	205 67(3)	OW
No 246	75 29 N	163 40	Sep 24, 23			10 2	82 41 6 N	10 2	07375	205	205 123	OW
No 208	75 29 N	165 28	Jun 27, 23	18 0	7 18 E					205		FM
No 203	75 28 N	164 30	Jun 20, 23	21 0	5 46 E					205		HUS
No 207	75 28 N	165 41	Jun 26, 23	17 9	7 22 E	10 6	82 45 6 N	10 6	07281	205	205 123	S&W
No 204	75 27 N	164 55	Jun 21, 23	18 2	6 00 E					205		HUS
No 221	75 26 N	166 45	Jul 30, 23	17 5	8 14 9 E					8		FM
No 247	75 25 N	163 44	Sep 25, 23	9 1	5 23 6 E			10 3,11 5	07404	8		S&M
No 205	75 25 N	165 10	Jun 22, 23			10 7	82 41 2 N	10 7	07360	205	205 123	OW
No 212	75 24 N	164 38	Jul 10, 23			10 7	82 40 1 N	10 7	07394	205	205 123	OW
			Jul 10, 23	17 3	5 40 3 E					8		FM
No 216	75 24 N	167 06	Jul 20, 23			10 7	82 35 1 N	10 7	07491	205	205 123	OW
No 286	75 23 N	158 03	Dec 29, 23	12 2	2 19 0 E					8		FM
No 206	75 23 N	165 25	Jun 23, 23	17 8	7 14 E					205		HUS
No 218	75 23 N	167 28	Jul 23, 23	17 1	6 45 7 E					8		FM
No 284	75 22 N	158 00	Dec 27, 23	12 4	2 20 1 E					8		FM
No 285	75 22 N	158 02	Dec 28, 23			15 5	82 43 6 N	15 5	07377	205	205 123	OW
No 217	75 22 N	167 19	Jul 21, 23	18 1	6 12 3 E					8		FM
No 324	75 21 N	157 47	Apr 4 24	16 4	2 17 3 E					8		FM
No 202	75 21 N	164 32	Jun 18, 23			10 8	82 37 3 N	10 7	07440	205	205 123	OW
No 219	75 21 N	166 52	Jul 26, 23			10 7	82 33 2 N	10 7	07530	205	205 123	OW
			Jul 26, 23	17 5	6 33 1 E					8		FM
No 220	75 21 N	166 53	Jul 27, 23					10 7,11 9	07488	8		HUS
No 323	75 20 N	157 51	Apr 3, 24			9 8	82 46 7 N	9 8	07293	205	205 236	OW
No 287	75 20 N	158 04	Dec 31, 23			11 6	82 47 4 N	11 6	07290	205	205 123	HUS
No 297	75 19 N	156 22	Jan 24, 24	10 4,11 7	1 27 8 E			10 4,11 7	07373	8		HUS
No 322	75 19 N	157 55	Apr 2, 24	15 6	2 10 4 E					8		FM
No 281	75 19 N	158 29	Dec 20, 23	15 1	2 38 8 E			10 1,11 6	07383	8		S&M
No 318	75 18 N	158 04	Mar 24, 24			10 4	82 43 4 N	10 4	07350	205	205 236	OW
			Mar 24, 24	15 6	2 01 8 E					8		FM
No 282	75 18 N	158 34	Dec 21, 23			10 3	82 43 1 N	10 3	07366	205	205 123	OW
No 283	75 18 N	158 38	Dec 22, 23	12 8	2 33 3 E					8		FM
No 298	75 17 N	156 26	Jan 25, 24			10 3	82 46 2 N	10 3	07294	205	205 236	OW
No 321	75 17 N	158 01	Mar 31, 24	15 8	2 04 1 E					8		FM
No 320	75 17 N	158 05	Mar 28, 24			10 0	82 43 7 N	10 0	07338	205	205 236	OW
			Mar 28, 24	15 7	2 26 4 E					8		FM
No 319	75 17 N	158 15	Mar 26, 24	15 7	2 19 0 E					8		FM
No 266	75 17 N	159 16	Nov 17, 23	8 9	2 57 8 E			10 0,11 7	07356	8		S&M
No 201	75 17 N	164 32	Jun 17, 23	17 7	5 38 3 E					8		FM
No 299	75 16 N	156 30	Jan 26, 24	9 0	1 20 2 E					8		FM
No 296	75 16 N	156 46	Jan 21, 24			10 4	82 43 6 N	10 4	07346	205	205 236	OW
			Jan 21, 24	14 9	1 35 5 E					8		FM
No 316	75 16 N	158 35	Mar 19, 24	15 3	2 20 4 E					8		FM
No 274	75 16 N	158 59	Dec 5, 23	9 1	3 20 0 E					8		FM
No 317	75 15 N	158 16	Mar 22, 24			10 4	82 42 2 N	10 4	07360	205	205 236	OW
			Mar 22, 24	15 3	2 07 4 E					8		FM
No 275	75 15 N	158 57	Dec 7, 23	9 0	2 51 2 E					8		FM
			Dec 7, 23			10 8	82 38 2 N	10 7	07453	205	205 123	OW
No 267	75 15 N	159 11	Nov 19, 23			10 2	82 40 0 N	10 2	07417	205	205 123	OW
			Nov 19, 23	16 4	2 55 6 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 268	75 15 N	159 20	Nov 21, '23					10 4,11 9	07455	8		HUS
No 269	75 15 N	159 27	Nov 23, 23			10 2	82 42 0 N	10 2	07369	205	205 123	OW
No 270	75 15 N	159 31	Nov 24, 23	9 0	2 57 3 E					8		FM
No 265	75 15 N	159 35	Nov 16, 23			10 4	82 38 6 N	10 4	07482	205	205 123	OW
No 280	75 14 N	158 46	Dec 18, 23	14 8	2 30 6 E					8		FM
No 279	75 14 N	158 50	Dec 17, 23			10 5	82 44 5 N	10 5	07350	205	205 123	OW
No 273	75 14 N	159 14	Dec 3, 23	9 0	2 58 2 E					8		FM
			Dec 3, 23			10 6	82 38 7 N	10 5	07444	205	205 123	OW
No 248	75 14 N	163 55	Sep 28, 23			10 0	82 43 0 N	10 0	07382	205	205 123	OW
			Sep 28, 23	15 7	5 26 9 E					8		FM
No 301	75 13 N	156 32	Jan 31, 24	9 0	1 29 7 E					8		FM
No 300	75 13 N	156 36	Jan 28, 24			10 3	82 41 8 N	10 3	07381	205	205 236	OW
			Jan 28, 24	17 7	1 26 4 E					8		FM
No 302*a*	75 13 N	156 38	Feb 1, 24			10 4	82 41 0 N	10 3	07455	205	205 236	OW
No 302*b*	75 13 N	156 45	Feb 2, 24	8 9	1 32 2 E					8		FM
No 315	75 13 N	158 45	Mar 17, 24			10 5	82 38 0 N	10 4	07442	205	205 236	OW
			Mar 17, 24	15 4	2 22 9 E					8		FM
No 276	75 13 N	159 02	Dec 12, 23	9 0	2 44 7 E					8		FM
No 277	75 13 N	159 02	Dec 13, 23			11 1	82 37 3 N	11 1	07472	205	205 123	OW
			Dec 13, 23			11 2	82 36 9 N	11 1	07480	205	205 67(3)	OW
No 303	75 12 N	156 57	Feb 4, 24			11 2	82 42 3 N	11 2	07380	205	205 123	OW
			Feb 4, 24			11 3	82 41 7 N	11 3	07417	205	205 67(3)	OW
			Feb 4, 24	17 9	1 42 8 E			15 8,17 0	07378	8		S&M
No 314	75 12 N	158 38	Mar 14, 24			10 7	82 38 6 N	10 7	07419	205	205 236	OW
			Mar 14, 24	20 3	2 20 4 E					8		FM
No 312	75 12 N	158 47	Mar 10, 24			10 7	82 38 4 N	10 7	07422	205	205 236	OW
			Mar 10, 24	19 6	2 19 8 E					8		FM
No 278	75 12 N	159 01	Dec 14, 23	15 0	2 42 4 E					8		FM
No 271	75 12 N	159 42	Nov 26, 23			10 3	82 38 7 N	10 3	07442	205	205 123	OW
			Nov 26, 23	16 5	2 55 4 E					8		FM
No 200	75 12 N	164 40	Jun 15, 23			9 8	82 34 0 N	9 8	07501	205	205 123	OW
No 305	75 11 N	157 39	Feb 8, 24			10 5	82 37 8 N	10 5	07505	205	205 236	OW
			Feb 8, 24	17 4	2 08 8 E					8		FM
No 313	75 11 N	158 37	Mar 12, 24	20 4	2 13 2 E					8		FM
No 306	75 11 N	158 45	Feb 12, 24			10 6	82 35 0 N	10 6	07553	205	205 236	OW
No 293	75 10 N	157 20	Jan 16, 24	17 7	1 51 5 E					8		FM
No 294	75 10 N	157 21	Jan 18, 24			10 5	82 37 2 N	10 5	07456	205	205 236	OW
No 295	75 10 N	157 21	Jan 19, 24	8 9	1 57 8 E					8		FM
No 292	75 10 N	157 23	Jan 14, 24			10 4	82 41 0 N	10 4	07384	205	205 236	OW
			Jan 14, 24	14 8	1 47 5 E					8		FM
No 304	75 10 N	157 38	Feb 6, 24	17 6	2 10 2 E					8		FM
No 264	75 09 N	160 40	Nov 12, 23			10 3	82 28 3 N	10 3	07607	205	205 123	OW
No 291	75 08 N	157 30	Jan 12, 24	9 0	1 59 5 E					8		FM
No 272	75 08 N	159 39	Nov 30, 23	9 0	2 54 8 E					8		FM
			Nov 30, 23			10 6	82 31 6 N	10 6	07564	205	205 123	OW
No 308	75 07 N	159 00	Feb 22, 24			10 2	82 33 0 N	10 2	07624	205	205 236	OW
			Feb 22, 24	17 9	2 31 5 E					8		FM
No 310	75 06 N	159 27	Mar 3, 24			10 3	82 29 3 N	10 3	07578	205	205 236	OW
			Mar 3, 24	19 8	2 48 4 E					8		FM
No 199	75 06 N	164 48	Jun 13, 23	9 4	6 21 0 E					8		FM
No 290	75 05 N	157 47	Jan 11, 24			10 4	82 32 9 N	10 4	07526	205	205 236	OW
No 307	75 05 N	159 01	Feb 19, 24			10 6	82 32 4 N	10 6	07602	205	205 236	OW
			Feb 19, 24	17 9	2 28 0 E					8		FM
No 263	75 05 N	161 20	Nov 9, 23			10 3	82 26 1 N	10 2	07645	205	205 123	OW
No 255	75 05 N	162 55	Oct 18, 23	18 3	4 42 8 E					8		FM
No 198	75 05 N	164 44	Jun 11, 23			17 3	82 22 3 N	17 3	07705	205	205 123	OW
No 311	75 04 N	159 01	Mar 7, 24			11 0	82 33 7 N	10 9	07499	205	205 236	OW
			Mar 7, 24	20 9	2 27 9 E					8		FM
No 309	75 04 N	159 22	Feb 25, 24			10 4	82 28 7 N	10 3	07666	205	205 236	OW
			Feb 25, 24	19 8	2 54 3 E					8		FM
No 196	75 04 N	164 41	Jun 7, 23	17 3	5 34 8 E					8		FM
No 197	75 04 N	164 43	Jun 8, 23			15 9	82 11 0 N	15 9	07886	205	205 123	OW
No 260	75 03 N	161 40	Nov 5, 23	17 7	3 57 4 E					8		FM
No 261	75 03 N	161 43	Nov 6, 23			10 4	82 22 8 N	10 4	07697	205	205 123	OW
No 262	75 02 N	161 46	Nov 7, 23	18 0	3 59 2 E					8		FM
No 256	75 02 N	162 44	Oct 19, 23			10 0	82 13 3 N	10 0	07885	205	205 123	OW
No 288	74 58 N	158 46	Jan 7, 24	9 7	2 14 2 E					8		FM
			Jan 7, 24			15 5	82 29 4 N	15 5	07585	205	205 236	OW
No 249	74 58 N	164 15	Oct 1, 23			9 9	82 14 1 N	9 9	07844	205	205 123	OW
No 289	74 57 N	158 22	Jan 9, 24	9 4	2 02 9 E					8		FM
No 254	74 57 N	164 20	Oct 15, 23			9 9	82 08 9 N	9 9	07916	205	205 123	OW
No 195	74 56 N	165 00	Jun 4, 23			10 4	82 10 4 N	10 5	07892	205	205 123	OW
No 194	74 55 N	165 24	Jun 1, 23			10 7	82 12 6 N	10 7	07862	205	205 123	OW

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 193	74 55 N	165 31	May 31, '23	17 2	6 29 0 E					8		FM
No 257	74 54 N	162 10	Oct 22, 23			10 3	82 20 5 N	10 3	*07731*	*205*	205 123	OW
			Oct 22, 23	17 4	3 33 5 E					8		FM
No 259	74 53 N	161 58	Oct 26, 23			10 1	82 10 5 N	10 1	*07896*	*205*	205 123	OW
No 253	74 50 N	165 42	Oct 12, 23			10 4	82 03 0 N	10 4	*08028*	*205*	205 123	OW
			Oct 12, 23	18 1	5 37 1 E					8		FM
No 258	74 49 N	162 23	Oct 23, 23	17 5	3 50 7 E					8		FM
No 192	74 47 N	165 49	May 29, 23			11 6	82 02 0 N	11 6	*08022*	*205*	205 123	OW
			May 29, 23	17 3	6 03 0 E					8		FM
No 339*b*	74 45 N	154 26	May 1, 24			10 3	83 31 6 N	10 3	*06609*	*205*	205 236	OW
No 250*a*	74 45 N	165 00	Oct 5, 23			11 3	82 04 8 N	11 2	*07977*	*205*	205 123	OW
			Oct 5, 23			11 3	82 04 4 N	11 2	*07984*	*205*	205 67(3)	OW
No 250*b*	74 45 N	165 00	Oct 5, 23					10 5,11 8	07974	8		HUS
No 184	74 43 N	166 20	May 8, 23			11 6	81 57 8 N	11 5	*08091*	*205*	205 123	OW
No 183	74 43 N	166 24	May 7, 23	16 6	5 44 4 E					8		FM
No 185	74 42 N	166 09	May 11, 23			11 1	82 00 1 N	11 0	*08051*	*205*	205 123	OW
			May 11, 23	17 0	5 33 1 E					8		FM
No 182	74 42 N	166 22	May 4, 23			10 6	82 05 6 N	10 6	*07948*	*205*	205 123	OW
No 186	74 41 N	166 10	May 14, 23			10 7	81 59 2 N	10 6	*08077*	*205*	205 123	OW
			May 14, 23			10 7	81 58 9 N	10 6	*08074*	*205*	205 67(3)	OW
			May 14, 23	16 6	5 40 8 E					8		FM
No 181	74 41 N	166 20	May 2, 23	16 7	5 43 8 E					8		FM
No 191*a*	74 40 N	166 09	May 25, 23					10 1,11 4	08080	8		HUS
No 191*b* (tent)	74 40 N	166 09	May 25, 23			10 9	81 58 3 N	10 9	*08077*	*205*	205 123	OW
No 251	74 39 N	165 30	Oct 8, 23			10 1	81 59 2 N	10 0	*08084*	*205*	205 123	OW
No 189	74 39 N	166 13	May 22, 23			10 4	81 59 7 N	10 4	*08043*	*205*	205 123	OW
			May 22, 23	17 0	5 35 0 E					8		FM
No 190	74 39 N	166 14	May 24, 23	17 5	5 41 6 E					8		FM
No 180	74 39 N	166 34	Apr 30, 23			10 0	82 01 5 N	10 0	*08015*	*205*	205 123	OW
			Apr 30, 23	16 6	5 48 6 E					8		FM
No 252	74 38 N	165 40	Oct 9, 23	20 6	4 56 4 E					8		FM
No 187	74 38 N	166 18	May 18, 23			10 3	82 03 9 N	10 3	*07991*	*205*	205 123	OW
No 188	74 38 N	166 20	May 19, 23	17 4	5 40 8 E					8		FM
No 179	74 29 N	167 26	Apr 27, 23			10 7	81 54 0 N	10 7	*08154*	*205*	205 123	OW
			Apr 27, 23	16 5	6 16 2 E					8		FM
No 165	74 27 N	168 56	Mar 28, 23	15 9	7 16 6 E					8		FM
No 176	74 26 N	167 51	Apr 20, 23			10 1	81 52 0 N	10 1	*08169*	*205*	205 123	OW
No 178*a*	74 26 N	167 51	Apr 23, 23			10 5	81 47 4 N	10 4	*08253*	*205*	205 123	OW
No 178*b*	74 26 N	167 50	Apr 25, 23	16 4	6 28 1 E					8		FM
No 177	74 26 N	167 52	Apr 21, 23	15 9	6 40 5 E					8		HUS
No 166	74 25 N	168 46	Mar 30, 23			10 8	81 48 6 N	10 8	*08214*	*205*	205 123	OW
No 167	74 24 N	168 35	Apr 2, 23			10 8	81 48 5 N	10 8	*08231*	*205*	205 123	OW
No 164	74 24 N	169 04	Mar 26, 23			10 8	81 43 0 N	10 7	*08314*	*205*	205 123	OW
			Mar 26, 23	15 9	6 49 7 E					8		FM
No 168	74 22 N	168 31	Apr 4, 23	15 8	6 55 8 E					8		FM
No 175	74 21 N	168 31	Apr 18, 23	16 5	6 43 1 E					8		FM
No 172	74 20 N	168 25	Apr 12, 23	16 5	6 42 2 E					8		FM
No 173	74 20 N	168 26	Apr 13, 23			10 8	81 44 8 N	10 8	*08300*	*205*	205 123	OW
No 171	74 20 N	168 28	Apr 11, 23					10 1,11 2	08248	8		HUS
No 169	74 20 N	168 32	Apr 6, 23			10 0	81 46 6 N	10 0	*08247*	*205*	205 123	OW
			Apr 6, 23	15 7	6 49 0 E					8		FM
No 170	74 20 N	168 35	Apr 9, 23			10 8	81 47 6 N	10 8	*08230*	*205*	205 123	OW
			Apr 9, 23	16 6	6 47 5 E					8		FM
No 174	74 19 N	168 28	Apr 16, 23			10 2	81 46 0 N	10 3	*08262*	*205*	205 123	OW
			Apr 16, 23	16 3	6 53 5 E					8		FM
No 145	74 17 N	169 59	Feb 20, 23			11 0	81 40 3 N	11 0	*08355*	*205*	205 123	OW
			Feb 20, 23	18 3	7 45 7 E					8		FM
No 163	74 16 N	169 30	Mar 24, 23			10 3	81 41 5 N	10 3	*08336*	*205*	205 123	OW
No 162	74 13 N	169 43	Mar 23, 23	15 6	7 26 8 E					8		FM
No 144	74 13 N	169 55	Feb 19, 23	19 6	7 37 7 E					8		FM
No 161	74 12 N	169 46	Mar 21, 23	15 7	7 31 1 E					8		FM
No 160	74 11 N	169 42	Mar 20, 23			11 0	81 38 6 N	11 0	*08367*	*205*	205 123	OW
No 159	74 10 N	169 38	Mar 19, 23	15 8	7 03 6 E					8		FM
No 158	74 10 N	169 45	Mar 17, 23			11 0	81 37 7 N	11 0	*08384*	*205*	205 123	OW
No 157	74 10 N	169 49	Mar 16, 23	15 6	7 35 6 E					8		FM
No 153	74 10 N	169 52	Mar 8, 23	20 6	7 51 6 E					8		FM
No 156	74 10 N	169 58	Mar 13, 23			10 6	81 38 0 N	10 6	*08385*	*205*	205 123	OW
No 147	74 10 N	170 03	Feb 23, 23					16 0,17 2	08348	8		HUS
No 155	74 10 N	170 04	Mar 12 23	15 6	7 46 7 E					8		FM
No 154	74 09 N	170 13	Mar 10, 23			10 5	81 38 4 N	10 5	*08385*	*205*	205 123	OW
			Mar 10, 23	15 5	7 50 1 E					8		FM
No 148	74 07 N	170 05	Feb 24, 23			10 8	81 40 7 N	10 8	*08330*	*205*	205 123	OW
No 143	74 06 N	170 05	Feb 17, 23			10 1	81 32 4 N	10 0	*08477*	*205*	205 1	OW
No 140	74 06 N	170 16	Feb 12, 23	17 5	7 54 7 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 149	74 05 N	170 06	Feb 25, '23	19 7	7 45 5 E					8		FM
No 141	74 05 N	170 15	Feb 13, 23			11 8	81 35 9 N	11 8	08443	205	205 123	OW
No 142	74 04 N	170 10	Feb 16, 23	19 8	7 50 5 E					8		FM
No 152	74 02 N	170 28	Mar 6, 23			11 3	81 35 7 N	11 4	08440	205	205 123	OW
			Mar 6, 23	19 3	8 02 4 E					8		FM
No 151	74 01 N	170 47	Mar 3, 23			10 7	81 34 7 N	10 7	08455	205	205 123	OW
			Mar 3, 23	19 6	7 59 8 E					8		FM
No 139	74 00 N	170 32	Feb 10, 23			11 0	81 33 7 N	11 1	08480	205	205 123	OW
No 150	73 59 N	170 38	Mar 1, 23	19 5	8 04 3 E	11 8	81 30 3 N	11 8	08517	8	205 123	W&M
No 137	73 54 N	170 40	Feb 7, 23	17 0	7 48 7 E					8		FM
No 138	73 54 N	170 49	Feb 8, 23	17 2	7 50 4 E					8		FM
No 136	73 53 N	170 39	Feb 6, 23			16 3	81 27 3 N	16 3	08606	205	205 123	OW
No 135	73 52 N	170 38	Feb 5, 23	17 2	7 52 2 E					8		FM
No 134	73 51 N	170 39	Feb 3, 23			11 2	81 26 7 N	11 2	08611	205	205 123	OW
No 133	73 50 N	170 39	Feb 2, 23	17 4	7 53 7 E					8		FM
No 132	73 42 N	171 16	Jan 30, 23			11 9	81 12 3 N	11 9	08846	205	205 123	OW
			Jan 30, 23			11 9	81 12 3 N	11 9	08834	205	205 67(3)	OW
			Jan 30, 23	16 4	7 36 7 E					8		FM
No 131	73 42 N	171 25	Jan 28, 23	17 5	7 32 0 E					8		FM
No 130	73 40 N	171 12	Jan 26, 23			11 0	81 13 2 N	10 9	08838	205	205 123	OW
No 127	73 39 N	170 51	Jan 22, 23	16 8	7 29 2 E					8		FM
No 128	73 39 N	170 54	Jan 23, 23			11 4	81 09 5 N	11 4	08902	205	205 123	OW
No 120	73 39 N	170 58	Jan 24, 23	16 7	7 16 9 E					8		FM
No 125	73 36 N	169 38	Jan 17, 23			11 1	81 15 9 N	11 1	08786	205	205 123	OW
			Jan 17, 23	17 2	7 14 3 E					8		FM
No 120	73 35 N	170 06	Jan 9, 23	17 4	7 12 6 E					8		FM
No 121	73 34 N	170 08	Jan 10, 23			10 7	81 09 4 N	10 6	08907	205	205 123	OW
No 123	73 34 N	170 10	Jan 12, 23					10 6,11 9	08894	8		HUS
No 124	73 34 N	170 10	Jan 13, 23			10 7	81 10 7 N	10 7	08897	205	205 123	OW
			Jan 13, 23	17 4	7 12 0 E					8		FM
No 122	73 34 N	170 11	Jan 11, 23	15 9	7 05 5 E					8		FM
No 126	73 33 N	169 58	Jan 20, 23	17 4	7 05 2 E					8		FM
No 119	73 33 N	170 24	Jan 6, 23	9 0	7 03 3 E					8		FM
			Jan 6, 23			10 7	81 07 5 N	10 7	08929	205	205 123	OW
No 110	73 33 N	172 05	Dec 17, 22	17 5	8 01 5 E					8		FM
No 111	73 32 N	172 08	Dec 19 22			10 7	81 05 4 N	10 7	08938	205	205 123	OW
			Dec 19, 22	14 9	8 03 0 E					8		FM
No 83	73 32 N	174 25	Nov 4, 22			11 4	81 05 3 N	11 2	08922	205	205 123	OW
			Nov 4, 22			11 8	81 04 7 N	12 1	08914	205	205 67(3)	OW
			Nov 4, 22	18 3	10 15 9 E					8		HUS
No 112	73 31 N	172 09	Dec 20, 22					11 0,12 3	08940	8		HUS
No 113	73 31 N	172 11	Dec 23, 22			10 0	81 04 4 N	9 9	09003	205	205 123	HUS
			Dec 23, 22	17 4	8 06 9 E					8		FM
No 84	73 29 N	174 26	Nov 5, 22	17 8	10 21 2 E					8		FM
No 109	73 28 N	172 19	Dec 16, 22	9 0	8 37 4 E					8		FM
No 106	73 28 N	173 05	Dec 12, 22			11 8	81 03 9 N	11 6	08925	205	205 123	OW
			Dec 12, 22			12 0	81 04 6 N	12 1	08924	205	205 67(3)	OW
			Dec 12, 22	16 3	8 55 0 E					8		FM
No 118	73 27 N	171 07	Jan 4, 23	16 2	7 23 2 E					8		FM
No 114	73 26 N	171 53	Dec 28, 22	17 7	7 40 4 E					8		FM
No 117	73 25 N	171 30	Jan 2, 23			10 3	81 00 2 N	10 2	09028	205	205 123	OW
			Jan 2, 23	15 0	7 39 0 E					8		FM
No 116	73 25 N	171 44	Dec 31 22	16 1	7 42 9 E					8		FM
No 108	73 25 N	172 36	Dec 15, 22			15 9	80 55 3 N	15 9	09101	205	205 123	HUS
No 105	73 25 N	173 12	Dec 11, 22	16 1	9 03 7 E					8		FM
No 85	73 25 N	174 21	Nov 7, 22			11 3	81 01 6 N	11 3	08976	205	205 123	OW
No 115	73 24 N	171 48	Dec 29, 22			11 4	80 58 5 N	11 4	09058	205	205 123	OW
			Dec 29, 22	16 7	7 38 2 E					8		FM
No 107	73 22 N	172 54	Dec 14, 22	15 6	8 38 1 E					8		FM
No 82	73 22 N	175 05	Oct 31, 22			10 7	80 56 2 N	10 6	09016	205	205 123	OW
No 86	73 21 N	174 16	Nov 9, 22			10 6	80 57 5 N	10 6	09084	205	205 123	OW
			Nov 9, 22	17 5	10 20 7 E					8		FM
No 94	73 16 N	173 53	Nov 18, 22	18 3	9 42 2 E					8		FM
No 95	73 16 N	173 54	Nov 19, 22	17 3	9 48 3 E					8		FM
No 99	73 15 N	173 32	Nov 29, 22			11 3	80 49 9 N	11 4	09164	205	205 123	OW
			Nov 29, 22	16 4	9 07 2 E					8		FM
No 90	73 15 N	173 52	Nov 14, 22			11 2	80 51 4 N	11 2	09146	205	205 123	OW
No 93	73 15 N	174 01	Nov 17, 22			10 8	80 52 4 N	10 8	09127	205	205 123	OW
			Nov 17, 22	17 2	10 00 8 E					8		FM
No 92	73 15 N	174 04	Nov 16, 22	17 0	9 58 5 E					8		FM
No 87	73 15 N	174 28	Nov 10, 22	17 4	10 22 4 E					8		FM
No 100	73 14 N	173 32	Nov 30, 22	16 4	9 26 0 E					8		FM
No 103	73 14 N	173 44	Dec 8, 22	9 2	9 32 6 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Concluded*

Station	Latitude		Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
					Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′		° ′		h h h	° ′	h h	° ′	h h	c g s			
No 89	73 14	N	174 04	Nov 13, '22	17 6	9 58 0 E					8		FM
No 91	73 14	N	174 08	Nov 15, 22	18 2	9 56 1 E					8		FM
No 88*a*	73 14	N	174 28	Nov 11, 22	18 0	9 42 4 E			11 5,13 0	09172	8		S&M
No 88*b*	73 14	N	174 28	Nov 11, 22			12 1	80 49 7 N	12 1	*09176*	*205*	205 123	OW
No 101	73 13	N	173 26	Dec 2, 22			11 2	80 48 0 N	11 2	*09201*	*205*	205 123	OW
				Dec 2, 22	17 7	9 21 2 E					8		FM
No 104	73 13	N	173 34	Dec 9, 22			11 1	80 49 5 N	11 1	*09182*	*205*	205 123	OW
				Dec 9, 22	18 2	9 15 6 E					8		FM
No 98	73 13	N	173 40	Nov 27, 22	9 7	9 27 2 E			11 0,12 7	09164	8		S&M
No 102	73 13	N	173 57	Dec 6, 22	9 3	9 29 7 E					8		FM
				Dec 6, 22			11 8	80 49 3 N	11 8	*09172*	*205*	205 123	OW
No 96	73 12	N	173 41	Nov 21, 22			11 5	80 49 9 N	11 5	*09169*	*205*	205 123	OW
				Nov 21, 22	20 1	9 37 8 E					8		FM
No 97	73 12	N	173 50	Nov 24, 22			11 6	80 49 6 N	11 6	*09173*	*205*	205 123	OW
				Nov 24, 22	16 9	9 23 9 E					8		FM
No 81*a*	73 10	N	175 40	Oct 28, 22			11 2	80 50 1 N	11 2	*09140*	*205*	205 123	OW
No 81*b*	73 10	N	175 40	Oct 28, 22					11 0,12 8	09179	8		HUS
No 80	73 06	N	175 52	Oct 27, 22	18 0	11 52 8 E					8		FM
No 79	73 06	N	175 55	Oct 26, 22			10 8	80 50 1 N	10 8	*09163*	*205*	205 123	OW
				Oct 26, 22	18 0	11 54 7 E					8		FM
No 78	73 06	N	176 07	Oct 25, 22	9 0,14 0	12 03 8 E					8		HUS
No 77	73 05	N	176 19	Oct 24, 22			10 7	81 00 2 N	10 7	*09019*	*205*	205 123	OW
No 75	73 02	N	176 45	Oct 22, 22					10 0,11 3	08938	8		HUS
No 74	73 00	N	176 58	Oct 21, 22			10 8	81 04 0 N	10 8	*08914*	*205*	205 123	OW
No 73	72 58	N	177 10	Oct 20, 22	9 1	11 36 2 E					8		HUS
No 63	72 58	N	184 15	Sep 30, 22			12 2	80 51 1 N	12 2	*09114*	*205*	205 123	OW
No 72	72 51	N	177 14	Oct 19, 22	8 9	10 42 8 E					8		HUS
No 71	72 50	N	177 25	Oct 18, 22	11 2	10 55 6 E					8		HUS
				Oct 18, 22	15 1	10 59 E	16 5	80 24 1 N	16 5	*09629*	*205*	205 123	S&W
No 64	72 49	N	180 47	Oct 7, 22	11 7	13 48 E	10 5	80 45 3 N	10 4	*09249*	*205*	205 123	HUS
No 70	72 48	N	177 36	Oct 17, 22	19 2	10 50 7 E					8		FM
No 66	72 42	N	179 10	Oct 13, 22	16 4	12 12 2 E					8		HUS
No 65	72 41	N	179 43	Oct 12, 22	15 8,17 8	13 25 E	16 8	80 34 9 N	16 7	*09413*	*205*	205 123	HUS
No 59	72 22	N	185 36	Aug 25, 22	9 1,11 0	16 54 E	10 1	80 33 2 N	10 1	*09432*	*205*	205 123	HUS
No 62	72 19	N	188 46	Sep 9, 22	9 2,11 1	19 46 E	10 2	80 35 7 N	10 2	*09398*	*205*	205 123	HUS
No 61	72 10	N	188 25	Sep 4, 22	14 7,16 5	19 34 E	15 6	80 21 6 N	15 6	*09647*	*205*	205 123	HUS
No 60	72 01	N	187 20	Aug 30, 22	14 0	18 25 E	15 1	80 00 9 N	15 1	*09917*	*205*	205 123	HUS
No 58	71 58	N	184 51	Aug 16, 22	14 5,16 1	15 46 E	15 3	79 54 2 N	15 3	*10056*	*205*	205 123	HUS
No 57	71 16	N	184 54	Aug 8, 22	14 7,16 2	15 47 E	15 5	79 27 3 N	15 5	*10433*	*205*	205 123	HUS
No 56	70 35	N	185 40	Aug 5, 22			9 7	78 58 6 N	9 6	*10893*	*205*	205 123	HUS

RESULTS[a] OF LAND MAGNETIC OBSERVATIONS, SECONDARY MAGNETIC STATIONS IN BERMUDA

JULY TO AUGUST 1907, BY H W FISK

Station		Latitude north	Longitude west of Gr	Date	Decl'n west		Inclination and intensity				
No	Name				L M T	Value	L M T	Incl'n north	Hor int	Vert int	Total int
		° ′	° ′	1907	h	° ′	h	° ′	c g s	c g s	c g s.
1	Daniel's Head	32 18 39	64 52 96	Jul 18	14 8	7 32	14 9	65 04	2294	4937	5444
2	Wreck Hill	16 88	53 22	Jul 18	17 9	7 23	18 2	64 54	2314	4940	5455
3	Tudor Hill	16 03	52 74	Jul 23	13 8	9 30	14 4	64 35	2344	4932	5461
4	Whitney Bay	15 60	52 67	Jul 24			15 7	64 34	2342	4919	5447
5	Scaur Lodge	17 08	52 50	Jul 19	6 9	7 53	7 5	64 30	2352	4927	5459
6	Cricket Ground	18 02	52 38	Jul 18	9 2	7 48	10 1	65 06	2310	4969	5480
7	Mangrove Bay	18 64	52 02	Jul 17	17 0	7 11	17 3	65 04	2298	4942	5453
8	Tatem Point	17 71	51 89	Jul 18	11 4	8 25	11 8	65 00	2323	4978	5493
9	Port Royal Bay	15 44	52 31	Jul 24			16 3	64 17	2340	4872	5407
10	Evans' Bay	15 66	52 05	Jul 23			12 5	64 31	2293	4809	5326
11	Frank's Bay	15 33	51 35	Jul 23			11 4	64 22	2339	4869	5400
12	Wilson's Island	15 34	50 63	Jul 23			10 4	64 40	2338	4935	5460
13	Morgan's Island	16 28	50 97	Jul 10	14 3	6 45	14 9	64 20	2361	4912	5450
14	Cemetery, Ireland Island	19 03	50 87	Jul 15	18 1	8 42	18 2	65 33	2271	4992	5484
15	Sailors' Home	18 88	50 68	Jul 17	9 2	7 52	9 8	65 47	2258	4967	5506
16	Ireland Island[b]	19 40	50 50	Jul 15	15 8	9 26	11 3	65 41	2259	4991	5486
17	Challenger Stone	19 37	50 40	Jul 16	15 9	9 26	16 1	65 38	2255	4974	5461
18	Gibbs' Hill	15 29	50 42	Jul 24	10 5	6 39	10 7	64 38	2350	4950	5479
19	Spectacle Island, *A*[b]	15 58	50 23	Jul 22	16 4	6 28	17 0	64 48	2350	4978	5519
20	Spectacle Island, *B*	15 61	50 21	Jul 22			9 2	64 46	2342	4967	5490
21	Burt Island	16 63	49 67	Jul 10	16 7	7 33	17 2	65 39	2291	5070	5566
22	Hawkins Island	17 28	49 80	Jul 13	17 4	8 54	17 6	65 31	2337	5127	5635
23	Nelly Island	17 08	49 54	Jul 11		8 10	11 8	64 59	2344	5023	5541
24	Cobbler's Island, *A*	18 55	49 22	Jul 13		10 46	12 1	66 36	2199	5081	5536
25	Cobbler's Island, *B*	18 53	49 19	Jul 13	13 8	11 08	14 8	66 18	2232	5081	5549
26	Spanish Point	18 28	49 08	Jul 10	16 7	9 37		65 35	2283	5023	5518
27	Agar's Island, *C*	17 74	48 65	Aug 6			12 7	66 27	2194	5068	5488
28	Agar's Island, *A*[b]	17 62	48 70	Jul 6–Jul 14	Various	10 22	Various	67 14	2121	5052	5490
29	Agar's Island, *B*	17 62	48 70	Jul 8, Aug 6		10 27	15 0	67 17	2116	5056	5482
30	Small Island No 1	17 42	48 97	Jul 10			12 8	65 56	2306	5161	5651
31	Dyer Island	17 27	48 73	Jul 10	14 1	7 53	11 6	65 59	2288	5132	5618
32	Small Island SE of Fern Island	16 96	48 86	Jul 10		8 38	14 1	65 46	2295	5106	5589
33	Clarence Cove	18 46	48 42	Jul 20	8 9	12 45	9 3	66 07	2236	5042	5514
34	Point Shares	17 58	48 52	Jul 10		10 22	10 3	66 42	2212	5131	5588
35	Channel Island	17 38	48 31	Jul 10	15 5	11 55	15 9	66 39	2222	5137	5597
36	Warwick Church	16 10	48 43	Jul 24			12 5	64 48	2385	5058	5594
37	Cross Roads	16 41	47 45	Jul 24			14 3	65 28	2345	5135	5645
38	Swan's Bay	18 35	47 70	Jul 20			11 7	66 44	2131	4956	5394
39	Ducking Stool, 3	18 40	47 28	Aug 1		9 50	14 4	66 25	2168	4959	5411
40	Ducking Stool, 1	18 40	47 24	Aug 1		9 31	11 7	66 20	2174	4943	5406
41	Ducking Stool, 2	18 41	47 09	Aug 1		9 13	14 2	66 23	2169	4954	5408
42	Mt Langton (Old Station)	18 21	47 17	Aug 3		11 11	10 7	66 44	2181	5068	5514
43	Mt Langton (New Station)	18 21	47 17	Aug 3		11 11	12 8	66 49	2157	5033	5475
44	Paget (Crow Lane) Church	17 01	46 73	Jul 24	15 3	10 52	15 7	65 40	2308	5099	5597
45	Poorhouse	18 01	46 76	Jul 31			17 0	66 01	2255	5061	5541
46	Ducking Stool, 4	18 38	47 36	Aug 1		10 12	15 8	66 48	2131	4968	5407
47	Crow Lane	17 65	46 30	Jul 24			17 6	65 55	2258	5046	5529
48	Prospect	17 93	46 20	Jul 31			16 5	65 37	2255	4972	5461
49	Crow Lane	17 66	46 03	Jul 31			13 6	65 50	2251	5013	5495
50	Doubtful										
51	Trimmingham Hill	17 50	46 10	Jul 24			16 8	65 43	2274	5032	5522
52	Camden	17 69	45 80	Jul 31			14 1	65 20	2283	4970	5469
53	Doe Bay	17 57	45 45	Jul 31			14 7	65 18	2284	4961	5461
54	Grocery Store	18 03	45 58	Jul 31			15 5	65 06	2300	4951	5460
55	Devonshire Church	18 37	45 42	Aug 2			17 5	65 32	2272	4987	5481
56	Sue Wood Bay	18 15	44 85	Aug 2	16 6	10 39	16 8	65 05	2309	4966	5477

[a] For information regarding instruments used in these observations, see pp 212–214

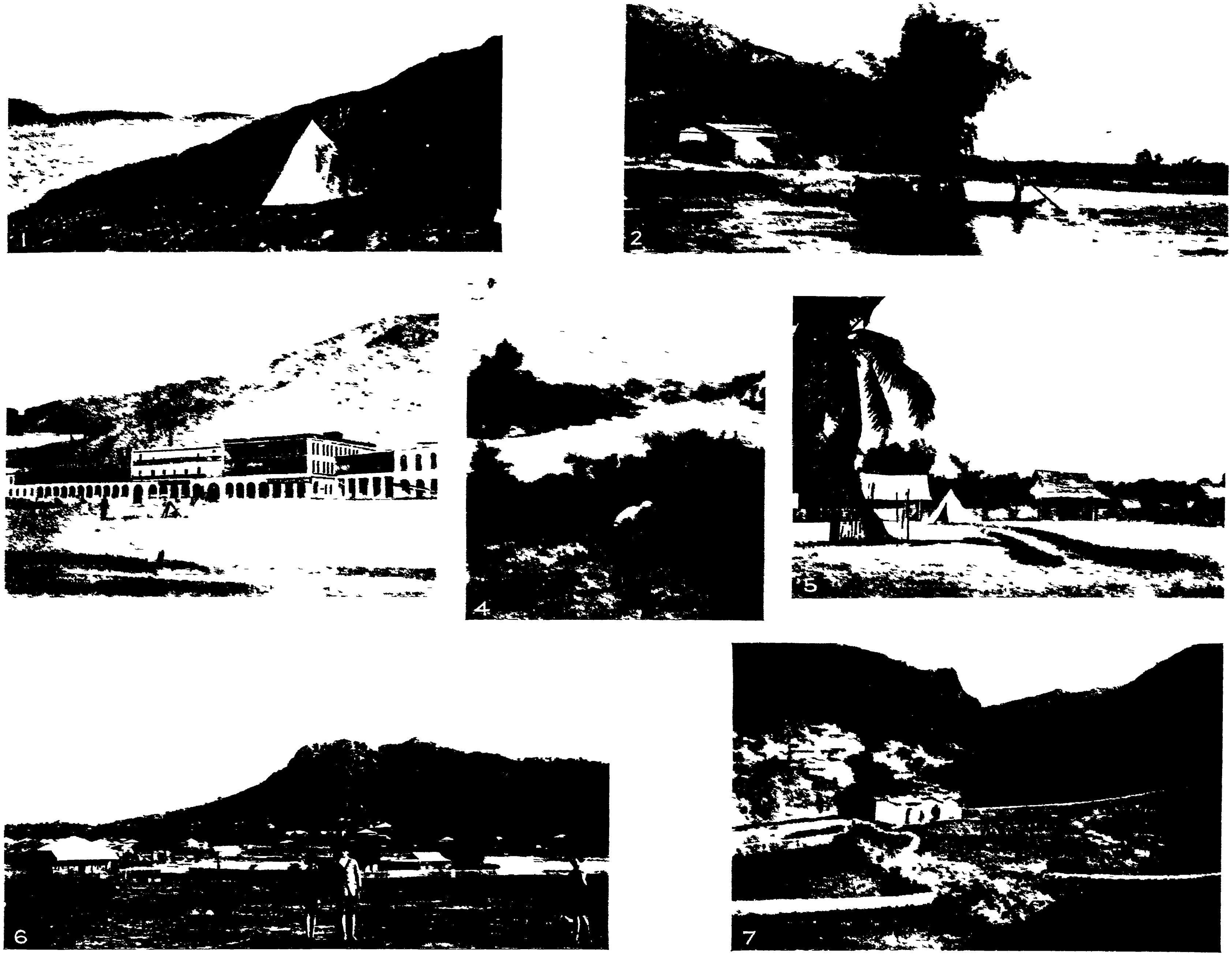
[b] Primary station, see Vol I, p 95

RESULTS[a] OF LAND MAGNETIC OBSERVATIONS, SECONDARY MAGNETIC STATIONS IN BERMUDA

JULY TO SEPTEMBER 1922, BY H W FISK, ASSISTED BY J T HOWARD—*Concluded*

Station		Latitude north	Longitude west of Gr	Date	Decl'n west		Incl'n north		Intensity			
No	Name				L M T	Value	L M T	Value	L M T	Hor	Vert	Total
		° ′	° ′	1922	h	° ′	h	° ′	h	c g s	c g s	c g s
50	Warwick Camp	32 15 55	64 48 66	Aug 1					(?)*	2244		
51	Mill Shares	17 93	48 46	Jul 26	10 7	11 04	10 8	66 37	10 9*	2122	4907	5346
52	Warwick Church	16 09	48 43	Jul 17	18 0	10 22	18 0	65 18	18 0*	2220	4826	5312
53	Khyber Pass	15 96	48 36	Aug 18	15 2	10 02	17 5	65 12	16 0	2280	4935	5436
54	Channel Island	17 38	48 31	Aug 9			17 5	67 41	17 5*	2129	5187	5607
55	Deep Bay	18 38	48 23	Jul 26	14 2	12 56	14 0	67 33	13 8	2044	4946	5352
56	Spectacle Island (Paget)	17 30	48 17	Aug 7			10 0	66 43	10 2*	2145	4985	5427
57	Cricket Ground (Warwick)	16 35	48 15	Sep 16			12 0*	66 06	12 3	2229	5030	5501
58	Belmont	16 68	48 13	Jul 17			12 0	66 35	12 0*	2126	4910	5351
59	Sand Hill	15 79	48 10	Jul 21	8 4	10 17	9 0	65 11	8 5*	2254	4874	5369
60	Doctor's Island	17 19	47 92	Aug 7	8 4	11 39	9 5	67 02	9 0*	2146	5064	5500
61	Darrell's Wharf	16 86	47 90	Jul 17	9 7	11 28	11 0	66 11	10 3*	2126	4815	5264
62	Fairyland	17 92	47 89	Jul 26	9 7	11 12	9 8	67 08	9 8*	2095	4967	5391
63	Pittsbay & Spanish Point Roads	18 07	47 90	Jul 26					16 7*	2080		
64	Swan's Bay	18 35	47 70	Jul 26	17 8	10 15	17 3	67 32	17 4*	2029	4907	5310
65	Northland Road (West)	18 25	47 65	Jul 26					16 9*	2008		
66	Southland Road	16 07	47 68	Aug 1					17 5	2260		
67	Northland Road (East)	18 20	47 62	Sep 20			17 0*	67 18	17 5	2077	4964	5381
68	A M E Chapel	16 61	47 62	Jul 15					12 7*	2243		
69	Simmons' Beach	16 15	47 50	Aug 1					(?)*	2262		
70	Lazy Corner	16 41	47 45	Jul 15	7 0	11 22	7 5	66 04	7 3*	2218	4996	5466
71	South Shore Hill	16 15	47 37	Jul 15	11 0	10 31	11 5	65 38	11 7*	2251	4971	5457
72	Paget-Warwick Road	16 27	47 34	Jul 15	9 8	11 04	10 0	65 41	10 2*	2239	4954	5436
73	Ducking Stool	18 39	47 26	Jul 24	15 6	12 18	15 5	67 06	15 5*	2052	4857	5272
74	Mount Langton	18 21	47 17	Jul 24	17 2	12 48	17 3	67 31	17 2	2053	4960	5368
75	Paget School (colored)	16 92	47 12	Jul 15	17 3	11 57	17 8	66 09	17 8*	2211	5000	5467
76	Elba Beach	16 45	46 88	Sep 16	14 7	12 18	14 5*	66 30	14 3	2197	5052	5509
77	Paget Church (St Paul)	17 01	46 78	Jul 15	16 0	13 21	16 3	66 10	16 2*	2213	5009	5476
78	Mangroville	17 47	46 54	Jul 18	16 2	13 13	16 3	66 36	16 2*	2134	4932	5375
79	Trimmingham Hill, *A*	17 30	46 23	Jul 18					17 0*	2181		
80	Trimmingham Hill, *B*	17 36	46 09	Jul 24	8 6	13 56	9 0	66 28	9 0	2153	4944	5392
81	Hungry Bay, *A*	17 51	45 87	Jul 18	17 5	14 27	17 6	66 14	17 6*	2158	4900	5354
82	Hungry Bay, *B*	17 33	45 79	Sep 16	16 4	14 19	16 0*	66 17	16 2	2154	4902	5355
83	Devonshire Church	18 37	45 44	Jul 24	14 0	13 08	13 8	66 06	12 7	2160	4875	5333
84	Devonshire Bay	18 09	44 80	Jul 24	9 9	12 46	10 5	65 39	10 0	2190	4839	5312
85	Bowen Point, *A*	20 10	44 57	Jul 25	16 4	11 28	16 5	65 31				
86	Bowen Point, *B*	20 08	44 49	Sep 20			15 4	65 32	15 8*	2191	4816	5290
87	Burchall Cove	20 28	44 44	Jul 25					16 4*	2206		
88	Flatts Bridge	19 44	44 31	Jul 25	14 1	13 41	13 8	65 35	14 0	2181	4803	5275
89	Spittal Pond	18 86	43 73	Sep 19			10 0*	65 32	10 0*	2193	4819	5294
90	Bailey's Bay	20 93	43 50	Jul 25					15 7*	2191		
91	Holy Trinity Church	20 74	43 25	Sep 20	14 3	11 36	14 0*	65 41	14 0*	2186	4837	5308
92	Devil's Hole	19 31	43 02	Jul 25	10 7	12 33	11 0	64 22	11 2	2310	4815	5341
93	Canton Point (below)	19 14	42 93	Sep 20					9 0*	2176		
	Canton Point (above)	19 14	42 93	Sep 20					9 2*	2180		
94	Joyce's Cave	21 14	42 88	Sep 20			12 4	65 50	12 7*	2182	4863	5330
95	Mangrove Lake	19 49	42 85	Sep 19					17 3*	2160		
96	Shark Hole	20 31	42 45	Sep 20	10 2	11 43	11 5*	64 45	10 5	2315	4908	5426
97	Long Bird Island	21 69	42 30	Jul 25					11 9*	2233		
98	Trott's Pond	19 81	42 31	Sep 19			11 4	65 23	11 3	2212	4829	5311
99	Church Cave (below)	20 2	41 9	Sep 19			14±*	65 41	14±*	2177	4818	5287
100	Church Cave (above)	20 2	41 9	Sep 19			16±*	65 38	16±*	2188	4832	5304
101	Tuckerstown	20 01	41 90	Sep 19					10 8*	2207		
102	St George Hotel, *A*	22 90	40 96	Jul 25					12 8*	2274		
103	St George Hotel, *B*	22 92	40 97	Aug 16	10 4	13 06	11 4	64 48	10 8	2268	4820	5327

[a] See footnote on preceding page



Views on Magnetic Expeditions

1 Station near Etah, Greenland
3 Station at Aden, Arabia
6 Station at Townsville, Australia

4 Station at Sinky Bay, Bermuda

2 Cable ferry, Quindio Trail, Colombia
5 Station at Rantabe, Madagascar
7 Station at Kalgan, China

OBSERVERS' FIELD REPORTS

The following reports, or extracts, will give some idea of the conditions under which the various magnetic surveys and magnetic exploratory expeditions, conducted during the period 1921–1926, have been accomplished Not infrequently the reports as submitted by the observers contain information of interest only to the Department and so have not been given in full It has been the purpose in presenting them to retain so much as will enable the reader to judge fairly of the care, skill, courage, and thoroughness required of the observer in planning and executing some of the more difficult journeys, as well as the pleasant and unpleasant experiences incident to the work of collecting the magnetic results published in this volume The reports will be found to contain matter of geographic interest and useful information for those planning excursions into the same fields

Detailed particulars regarding the stations will be found in the section of this volume entitled "Descriptions of Stations", where the arrangement is alphabetical according to country in each of the main geographical divisions, also alphabetically arranged The magnetic data are given in the Table of Results in which the arrangement of the main divisions and the countries or subdivisions under them is the same as that employed for the descriptions of stations, but in which the stations themselves are arranged according to latitude.

The arrangement adopted for the observers' reports is alphabetical under the names of the observers In order that the itinerary of the observer may be more readily traced, the names of the stations in the lists appended to each report are given in a chronological arrangement with dates and geographic positions. In case observations have been previously made in any locality by an observer of the Department, the name of the station appears in italics.

F C Brown, on Magnetic Work in Madagascar, October 1920 to July 1921

This report is conveniently divided into sections as follows

(1) Majunga to Tananarive By steamer and launch to Morololo, motor car to Maevatanana, by carrier caravan to Tananarive

(2) Tananarive to Tulear By motor car to Ambalavao, carrier caravan to Tongobory, river canoe to St Augustin, outrigger canoe to Tulear

(3) Tulear to Fort Dauphin By carrier caravan.

(4) Fort Dauphin to Tananarive By carrier caravan to Ambilo-Lemaitso, by rail to Tananarive

(5) Tananarive to Diego Suarez By rail to Moromanga and Anosiroa, by carrier caravan to Diego Suarez

(6) Diego Suarez down west coast By steamer to Ambohibe, carrier caravan to Maintirano, by outrigger canoe to Tambororano, by sailing lugger to Majunga

(1) Majunga to Tananarive

In accordance with the Director's instructions of January 10, 1920, supplemented by letters of subsequent dates, after finishing the African transcontinental expedition at Beira, the Observer landed at Majunga on October 14, 1920, to undertake an extensive magnetic survey of Madagascar Majunga is the chief port of the west coast of

Madagascar, and is a well laid-out town with two hotels, a cinema, and a number of trading stores normally well-stocked with provisions and general goods

After making the necessary observations, on October 20 the fortnightly river steamer was joined for Maevatanana for the journey to Tananarive. As the wet season on this coast is from November to May, at this time the river was at the lowest, and sandbanks and shallows were abundant We left Majunga in the late afternoon and by midnight had entered the river channel proper at Maovoay Soon thereafter the steamer found a resting place on one of the sandbanks, and at daylight, the tide being low, was high and dry, so that the passengers were able to take a stroll around her After the tide had risen and floated the steamer off, the journey up-stream was continued This winding river, whose channel is here about one-half mile wide, is famous in Madagascar for the number of crocodiles in its waters Often 50 of the brutes could be counted from the deck of the steamer

The following night was passed at Madirovalo, whence a start was made by daylight, but by 8 o'clock the river had become so shallow that further progress was impossible for the steamer, and the passengers were transferred to two small launches. On these we continued from noon throughout the night, a most uncomfortable one for all concerned, with people sleeping on boxes and on the floor, arriving at Morololo at dawn. At this season launches ascend no further than this point, which is at the junction of the Betsiboka and Ikopa rivers, though at high water the large steamers go to Maevatanana, 23 kilometers above. The journey therefore was continued by motor car over a good road, and Maevatanana was reached at 9 o'clock on the evening of October 23. It is a small town built on the side of a bare, rocky hill, and is said to be the hottest town in Madagascar A weekly service of motor cars leaves every Sunday for Tananarive, 345 kilometers distant, but in order to make the desired observations at intermediate places, I decided to proceed with carriers.

Carriers are obtained from the Administration and are paid 1 25 to 1 75 francs a day when loaded, and half those rates for the return to their starting-point, empty; this charge is inclusive, for they provide their own food. Loads must not exceed 25 kilos, and the favorite method of carrying appears to be for two men to combine their loads and tie them firmly to a bamboo pole, each taking one end of the pole on his shoulder; single loads are usually divided into two bundles, which are tied at each end of a short pole, the bearer then balancing this on his shoulder Apart from baggage, travel can be made either by rickshaw or "filanzana" The latter is a seat fixed between two poles, with a rest for the feet, and is carried by four men; it is usual for white men to take teams of eight, or at least six bearers, in order that they may relieve each other at frequent intervals.

The question of food in Madagascar, except for the desert regions of the south and the most out-of-the-way mountain tracks, is one of no difficulty. Rice forms the staple food of the majority of the inhabitants, and chickens and eggs can be obtained everywhere At large villages beef may be had several times a week, so that no great supply of tinned food need be carried. Rest-houses are found on all main routes, or failing these a hut is always available, and thus neither a tent nor an elaborate camping outfit is necessary A day's stage is about 40 kilometers on the average, representing 8 hours' march

From Maevatanana to Mahatsinjo, 144 kilometers, the motor road in general was followed, but owing to the heat travel was done either by moonlight or in the early morning and late evening. The first day's march of 34 kilometers is through a country of bare, rocky hills of most diverse formation, volcanic rocks, basalt, ironstone, quartz, granite, and limestone There is neither timber nor vegetation of any kind. At Andriba an elevation of 2,050 feet is attained, and Mahatsinjo, seated on the shoulder of a grassy mountain, is 3,050 feet above sea-level. At both these places there are hotels.

On November 1, at Mahatsinjo, the weekly car was joined as far as Ankazobe, 100 kilometers farther south, but owing to a breakdown with the baggage camion, the instruments and gear were sent on by carrier and did not arrive until November 4 The intervening country is a wilderness of steep-sided grassy mountains and lofty plateaus with no villages, and elevations of 5,000 feet are reached where the temperature is cool even in the summer A stay was made at Ankazobe until November 8 in the hope of being able to proceed by motor, two cars being under repair in the town, but finally a start was made for the capital, Tananarive, 105 kilometers distant, with carriers. Approaching Tananarive the lonely mountain slopes and valleys give way to a succession of villages and rice-fields, the former are often very amusing, for the Malgash is at present in a state of transition, and every style and shape of house can be seen, the result often being a most sad compromise between the ordinary native cottage and a European house with verandas The capital, which was reached on November 10, is a large town built on the steep slopes of a ridge-like mountain, rising about 1,000 feet above the surrounding plain given over to rice-fields. Under native rule it was an untidy collection of native houses, with no roads or sanitation, but now magnificent streets and boulevards have been built everywhere, and some pretty gardens and "places" laid out. The town is lighted by electricity, water is laid on, and rickshaws and motors ply for hire in the streets. There are several hotels and a few large general stores, besides scores of Indian and Hova traders

Table 9 shows the names of the stations occupied in the first section of the work, together with the dates of occupation and the geographic positions For additional details, see Descriptions of Stations and Table of Results in Volume IV of this series

TABLE 9

No	Name	Date	Lat South	Long East
		1920	° ′	° ′
1	Majunga, *A*	Oct 18	15 42 9	46 19
2	Majunga, *B*	Oct 15-16	15 43 4	46 19
3	Maevatanana, *A*	Oct 24	16 56 4	46 48
4	Maevatanana, *B*	Oct 25	16 56 9	46 48
5	Antsiafabositra	Oct 27-28	17 18 4	46 56
6	Andriba	Oct 29	17 36 3	46 54
7	Mahatsinjo	Oct 30-31	17 44 3	47 00
8	Ankazobe	Nov 4-5	18 18 9	47 06
9	Fihaonana	Nov 9	18 36 2	47 11
10	Tananarive Observatory, *A*	Nov 13-18	18 55 0	47 32
11	Tananarive Observatory, *B*	Nov 12-16	18 55 0	47 32
12	Tananarive	Nov 22	18 54 9	47 30

(2) TANANARIVE TO TULEAR

On November 12 the intercomparison of instruments was commenced at Tananarive Observatory, which occupies a hill summit outside the town Arrangements were also made for the southern journey to Tulear on the southwest coast, and, thanks to the courtesy of His Excellency the Governor General, Monsieur Garbit, every facility was granted, so that the departure was made on November 25 by public motor car for Antsirabe.

Antsirabe is 165 kilometers south of the capital with which it is connected by biweekly motor service, a railway is also under construction Being at an elevation of 5,000 feet, its climate is pleasantly cool, with the added attraction of hot springs and medicinal baths, it is referred to as the "Vichy" of Madagascar, and promises to become the health resort of South Africa After a short journey by rickshaw to Betafo, 23 kilometers distant, to reoccupy Père Colin's station of 1901, the journey was continued

southward over the central mountainous plateau to Ambalavao, which marks the end of the motor road, and is the starting-off point for the bush Supplies can be obtained here from the Chinese merchants

Leaving on December 11 with carriers, the small town of Ihosy was reached in two days, this place marking the commencement of the Bara country The Baras are a pastoral people and can not be made to work Among themselves they are quarrelsome, and their chief occupation seems to be cattle-stealing Though this latter is punishable by law, the natives regard it as a form of sport, and to have successfully stolen a few bullocks from another village is a sign of manhood Anyone who has been convicted by the Government and sent to prison, or, as the Baras themselves say, "to work for the white man," is quite a hero on his return

On December 17 we arrived at Betroka, the capital of the province, 225 kilometers southwest of Ambalavao It lies in the middle of a grassy plain, at an elevation of about 3,000 feet, and is a well laid-out little town, with tree-lined streets and fine gardens of roses Supplies are obtainable here from the Chinese merchants Since November the wet season had set in and rain fell almost daily, chiefly in heavy thunderstorms. Travel under such conditions was not pleasant, and southward of Ambalavao rain fell on some days practically all day long, making it difficult to obtain the necessary astronomical observations Another difficulty in traveling during the wet season is the crossing of the numerous rivers These after a storm become raging torrents which are quite impassable. Fortunately the water falls almost as rapidly as it rises, so that sometimes the traveler is delayed but a few hours

TABLE 10

No	Name	Date	Lat South	Long East
		1920	° ′	° ′
1	Antsirabe, *A*	Nov 26	19 52 2	47 00
2	Betafo	Nov 27	19 50 0	46 50
3	Antsirabe, *B*	Nov 28	19 51 9	47 00
4	Ambositra, *A*	Nov 30–Dec 1	20 31 8	47 13
5	Ambositra, *B*	Dec 2	20 32 4	47 14
6	Fianarantsoa, *A*	Dec 6–8	21 27 2	47 03
7	Fianarantsoa, *B*	Dec 7	21 27 2	47 02
8	Ambalavao	Dec 10	21 49	46 54
9	Zazafotsy	Dec 12–13	22 12	46 20
10	Ihosy	Dec 14	22 23 8	46 07
11	Lalana	Dec 16	22 55 0	46 06
12	Betroka	Dec 17–19	23 15 9	46 04
13	Ankatrafay	Dec 21	23 20	45 38
14	Ampasindrasoa	Dec 22	23 24 0	45 11
15	Benenitra	Dec 23–24	23 27 5	45 03
16	Tongobory	Dec 28	23 32 0	44 17
17	Tulear	Dec 31–Jan 2, 1921	23 21 2	43 37

Leaving Betroka on December 20 and proceeding westward toward Tulear by the main path, Benenitra was reached on December 23, the distance being approximately 120 kilometers A day before reaching Benenitra the path suddenly dropped 1,000 feet from the windy uplands to the valley of the Imaloto River, and the change in temperature was most depressing. The Bara villages passed through were small, though hospitable The women usually come out to welcome the white man, who is taken to a clean hut by the chief Eggs and chickens are plentiful, and at every village people offer them for sale Flies swarm over everything and are most unpleasant. Food can not be left uncovered for a moment, and taking a meal in a native hut is therefore a trying experience. At Benenitra it was hoped to be able to find canoes in which to

continue the journey down the Onilahy to St Augustin at its mouth, but as none was available, the path to Tongobory was followed with carriers Christmas day was spent at the American mission station of Manasoa, and Tongobory was reached on December 27 Here a canoe was obtained for St Augustin, where we arrived by nightfall and spent the evening at the American mission station. On the next day we came to Tulear, after a pleasant sail of six hours along the coast, inside the coral reef, in an outrigger sailing canoe This point marked the end of the second stage of the southern journey, and during the interval November 25 to December 31, 16 magnetic stations had been occupied

Table 10 shows the stations occupied on this section of the southern journey, with dates of occupation and geographic positions For additional details see Descriptions of Stations and Table of Results in Volume IV of this series

(3) TULEAR TO FORT DAUPHIN

Tulear is opposite Durban on the East Africa coast, four days' steam to the west, and there is occasional steamer communication It is likely to become the chief port of southern Madagascar, for the gap in the coral reefs allows large steamers to approach and gives shelter in bad weather As there is neither hotel nor rest-house in the town, however, the traveler must camp in the bush alongside, unless he has friends to accommodate him Here arrangements were made for the next stage of the journey to Fort Dauphin via Cap Ste Marie It is not generally known that southern Madagascar is a desert and that its vegetation is cactus, poison-bush, and thorn The Chef de Province at Tulear, Monsieur Guitou, very kindly sent to the interior post of Betoiky for a caravan of Mahafaly carriers, their men being considered hard enough to withstand the fatigue of the first stage to Androka, seven days' march along the coast Flooded rivers prevented the arrival of the carriers until January 8, and the following day a march was made back to St Augustin, 30 kilometers along the coast

Next morning the party avoided the cliffs to the south of the mouth of the Onilahy River by sailing in outrigger canoes to a fishing village some 5 miles distant and thence continuing on foot for two hours over soft sand to the village of Anakao From here on until arriving at Androka on January 15 the journey was very fatiguing on account of the loose sand of which the country is formed The Sun was almost in the zenith at noon, and the heat was very great from an hour after sunrise until sunset Water is very scarce and, when obtained, is both dirty and brackish, the water-holes being usually in low depressions where a layer of rock acts as a catchment The hole may be 6 feet deep, and the water is scooped out by the native women with a piece of shell By this means the filling of a large earthen pot is a lengthy business, and the women spend most of the morning at the holes It can be readily imagined that the sudden descent of some 20 thirsty carriers was an event over which they were not enthusiastic

Villages were neither numerous nor large The natives have cattle and flocks of sheep and goats which apparently thrive on a diet of cactus and thorn scrub These Mahafaly are often fine-looking men, tall and well built, with bronze-colored skin and straight noses Like the Bara, they avoid all forms of manual labor, and their chief hobby is collecting other persons' cattle On January 11, observations were made at Beheloka, a collection of a dozen miserable huts set down on the sandy shore of Sakoa Vay The water here is clean but very brackish The following night was spent at the village of Vohombe, which is even more miserable than Beheloka It is hidden away in a dense tangle of cactus and thorn, but the chief did not resent our intrusion and offered a sheep as a present My men passed a waterless night after a most fatiguing day, for the water, or rather mud, palatable enough to the good folk of the neighborhood no doubt, was even too thick and evil-smelling for them. At midnight it rained smartly for half

an hour, catching everyone unawares, and to add to the irony of the situation it was afterwards ascertained that this was the first rain for a period of three years Next day, January 13, considerable difficulty was experienced in covering the five hours to Lambeta Massy, a picturesque cave on the coast where there is a spring of fresh water in the rocks, uncovered at low tide The majority of the men had straggled in by 1 o'clock, but the last brought news that three carriers had fallen with their loads two hours' march distant and were "dying," which with a native is a term which covers any accident or disease from a cut finger to malaria But on hearing this news three men were immediately sent in with a water-bag They returned with the missing men by evening, and the night was spent at Itampolo after two hours more of weary plodding through the sand

Androka is a military post near the mouth of the Ilinta River, situated on a sandy ridge and backed by mangrove flats Owing to heavy rains in the interior, the river rose so much on January 17 that by evening a roaring noise of waters was heard, and in a short time the post was surrounded by water and the Indian trader's village was flooded out It was not until January 19 that the journey could be resumed The flooded Ilinta was crossed by means of a canoe, but not without great difficulty Owing, however, to the Menarandra also being in a flooded state, the more direct path could not be followed, but a march of 88 kilometers inland northeastward was necessitated to Ampanihy, a military post maintained by the French The latter river was crossed by a canoe ferry at Tranoroa, another military post, 33 kilometers distant Here the Mahafaly country was left behind and the Antandroy region entered These latter people are said to be the descendants of some Bara chiefs who were turned out of their own country Thus they resemble in many ways the Bara, though they appear to be inferior both in physique and intelligence This tribe lives on the undulating limestone plateau bounded by the Menarandra and Mandrare rivers, a desert region of cactus and strange vegetation where sometimes no rain falls for three years Yet, in spite of this, villages appear to be numerous, and the natives own large herds of cattle On January 22 we arrived at the abandoned military post of Tsimilofo and observations were made there the same evening, where a government well provided good water, and the next day a halt was made at the military post of Beloha In this region travel during the day is very fatiguing, and therefore a moonlight night was taken advantage of to make the final stage to Cap Ste Marie The village of Betaihboraka was reached next morning and a guide obtained for the Cape, the baggage and most of the carriers being left behind to rest at the village It is said that the Cape has been visited by very few white men, and it has yet to be thoroughly explored and mapped Lack of water ordinarily renders travel almost impossible, but, strangely enough, during my three-day stay in this region rain fell at frequent intervals, while a gale blew with great force from the southeast No latitude observation was obtainable, though a delay was made until nightfall in hopes of a star. Rain, however, fell continuously and, having neither food nor shelter for the men, a return was made to camp about midnight

The question of a supply of water for the carriers having been disposed of by the rains, there yet remained the problem of food Owing to the long drought, the prickly pear (cactus) had withered, thus depriving the natives of one of their chief food supplies A little manioc and maize can be grown during the rains, but the former harvest had been eaten as well as the supply set aside for seed Thus, to carriers already exhausted by famine and drought, marching with loads was doubly hard At each stop the men would consume large quantities of the green fruit of the cactus, which promptly caused their stomachs to swell like balloons and rendered them totally unfit for marching Whenever possible, sheep were bought for them, and in one hour from the purchase time the only signs of a feast would be a pile of undigested matter cleared out of the stomachs

of the animals and a few bones A sheep is killed by cutting the arteries in its neck, though every drop of blood is carefully collected in a calabash All the entrails, even the spleen, are eaten, and finally the sheep's skin is toasted over a fire, cut into strips, and disposed of Fortunately the animals do not have good fleeces, otherwise this last item in the repast would be rather a woolly one

Around Cap Ste Marie the natives, though not actively hostile, are not what might be termed friendly The presence of military posts at frequent intervals prevents trouble, and the traveler is not in danger At the villages, however, many of the women and children rush into the bush on the approach of a white man One's own carriers do not always act in a manner to inspire the confidence of the villagers On arrival they drop their loads and rush off to the nearest hut, enter unceremoniously, and immediately drink up any water or milk that may be lying about or help themselves to whatever food they see But this somewhat rough form of "hospitality" appears to be perfectly understood by their hosts Any luckless man who, on the approach of a caravan, is not wise enough to hide himself is promptly set on by the carriers, each man trying to dispose of his load or at least to have it carried on for him as far as the next village

TABLE 11

No	Name	Date	Lat South	Long East
		1920	° ′	° ′
1	Beholoka	Jan 11	23 54 5	43 40
2	Itampolo	Jan 14	24 40 8	43 55
3	Androka	Jan 15–17	25 01 7	44 04
4	Ampanihy	Jan 21	24 41 2	44 43
5	Tsimilofo	Jan 23	24 59 4	45 09
6	Cap Ste Marie	Jan 25	25 37 1	45 08
7	Faux Cap	Jan 27	25 34 0	45 30
8	Tsihombe	Jan 29	25 19 1	45 27
9	Ambovombe	Jan 31, Feb 1–2	25 10 6	46 02
10	Bevilany	Feb 3	25 00 4	46 33
11	Fort Dauphin	Feb 8	25 02 1	46 58

Leaving Betaimboraka on January 26, Faux Cap was reached the same evening after a hard, sandy stage in the pouring rain There is a gap in the coral reef at this latter place which permits the entrance of coasting luggers plying between Tulear and Fort Dauphin From Faux Cap a cart road leads over the sandhills northward for 30 kilometers to Tsihombe, a military post, where there are Chinese and Indian traders During the war this region flourished because of the high price paid for hides, skins, and "pois du cap" (a sort of soya bean), but now the present slump in trade has affected even this isolated spot Leaving Tsihombe on January 29, the journey of some 150 kilometers to Fort Dauphin was completed by February 5, and the southern journey was ended It now remained to return northward by the east coast, but as the next steamer was not due for three weeks, and as the few ports touched were unsheltered and inaccessible in bad weather, it was decided to continue with carriers

Table 11 gives list of stations occupied, with dates and geographic positions, for magnetic elements, see Table of Results

(4) FORT DAUPHIN TO TANANARIVE

Fort Dauphin is a most picturesque place, built on a rocky promontory jutting out into the sea and terminated by the remains of the fort built by Flacourt, a French adventurer, in 1648 His old powder-magazine and the gateway to the fort remain to this

day The town is now of little importance, though it is linked with Tamatave by a monthly coasting steamer.

Leaving Fort Dauphin on February 10, the semi-desert waterless country was exchanged for a coast where rain fell daily during the greater part of February and March and where the conditions approximated a tropical rain forest At Fort Dauphin the mountains come right down to the coast, but as one proceeds north they recede gradually until at Farafangana the plain and foothills are over 50 kilometers wide The coastal route is both unhealthy and uninteresting, the country undulates and is covered with clumps of bush and "travelers' palms," the latter being a graceful palm shaped like a fan Very wet weather prevailed, and the mosquitoes of an evening were both numerous and ferocious, particularly so at Vangaindrano, where one must sit in a sack reaching to the waist if any peace is desired after sundown

A glance at the map of the east coast will show that it has neither bays nor points and is unbroken save for the many rivers which, rising in the eastern line of mountains parallel to the coast, are often less than 100 kilometers long, though, at their mouths, as much as 5 kilometers wide No difficulty was experienced in crossing any of these waterways On the smaller rivers, canoes are attached to either bank by an endless rope, so that a ferryman is not necessary, while on the larger ones government ferrymen are maintained It is curious that the outrigger canoe is unknown on this coast, for it would save the traveler much anxiety, to see one's precious instruments placed in some flimsy "dug-out" which will perhaps be half-full of water by the time the other bank is reached, not to mention the personal risk in the crocodile-infested water, is not a pleasant experience Very few of the rivers are of any consequence, and the bar of sand at the mouth, erected by joint action of stream and surf, excludes entrance from the sea for anything but canoes; sometimes the river mouth is quite land-locked, and on several occasions the party arrived just as flood waters were breaking through.

The question of a sheltered port in this part of the coast is a matter which is now engaging the attention of the Government. Between Tamatave and Fort Dauphin, a distance of some 500 miles, there is no sheltered anchorage, and in bad weather the coastal steamers of the Messageries Maritimes may pass and repass a port several times before being able to discharge either passengers or cargo In fair weather the steamers lie from 1 to 3 miles off the coast and await the barges into which to discharge, but oftentimes the sea rises suddenly and the barges are lost in attempting to recross the bar. At Manakara there is a gap in the reef which offers a possibility of this estuary being made into a port, offering shelter in bad weather Between Farafangana and Mananjary are many waterways and creeks, running parallel to the coast and separated from the sea by a belt of bush often not more than 50 yards wide. These "pangalanes," as they are termed by the French, are practically continuous, and a few connecting canals have already been cut through, so that with the completion of others, it will be possible to travel on the east coast for great distances by canoe

The work was completed at Mananjary by March 7, and the next day the party left for Mahanoro, which was reached on March 15 after a detour to the west through Soavina, 60 kilometers inland. The coast was then followed to the village of Ambilo-Lemaitso, where the railway turns westward into the interior, and on March 22 the mail train was joined for Tananarive The repeat observations at Tamatave of Père Colin's observing-points were unfortunately not possible, owing to an outbreak of plague at that town, which was, of course, promptly quarantined

The capital was again reached on the evening of March 22 after an absence since November 25 During the period of four months, 44 magnetic stations had been established and a distance of 2,960 kilometers traveled, of which only 750 kilometers had been made by rail or automobile. A warm welcome back was extended by Bishop Kestell-

Cornish and his wife, of the Anglican mission, whose hospitality was thoroughly enjoyed through Easter until April 9, the interval being fully occupied with reduction of observations and arrangements for future work

Table 12 shows stations occupied, with dates and geographic positions, for magnetic data, see Table of Results

TABLE 12

No	Name	Date	Lat South	Long East
		1921	° ′	° ′
1	Iabako	Feb 11	24 37 1	47 10
2	Manantenina	Feb 13	24 16 6	47 18
3	Manambondro	Feb 15	23 49 7	47 31
4	Vangaindrano	Feb 18	23 20 8	47 35
5	Farafangana	Feb 21	22 49 4	47 49
6	Nangatsiotra	Feb 24	22 18 2	47 57
7	Manakara	Feb 25	22 08 6	48 02
8	Ambinany-Faraony	Feb 27	21 48 4	48 10
9	Mananjary	Mar 3-4	21 14 5	48 19
10	Nosivarika	Mar 9-10	20 34 3	48 30
11	Soavina	Mar 11	20 23 5	48 15
12	Ambinanindrano	Mar 13	20 05 2	48 19
13	Mahanoro	Mar 15-17	19 53 8	48 47
14	Vatomandry	Mar 19	19 20 2	48 57
15	Andevorante	Mar 21	18 57 0	49 05

(5) TANANARIVE TO DIEGO SUAREZ

This was a very hurried trip on account of the necessity of joining the S S *Dupleix* for a journey down the west coast One can not afford to miss steamer connections in Madagascar, where it may mean a delay of one to three months awaiting the next boat Leaving the capital on April 9, the first 210 kilometers were traveled by rail to Anosiroa via Moramanga From Anosiroa the journey north was continued by rickshaw to Ambatondrazaka and thence along the east shore of Lake Alaotra to the town of Imerimandroso From Moramanga northward to the lake extends a large plain which at one time was part of the lake The soil is very productive, and the swampy areas around the present lake are naturally utilized for rice fields The actual lake has now dwindled to a weed-choked expanse of water 40 kilometers long and with an average breadth of 10 kilometers Canoes are able to navigate in the channels of open water among the weeds, and from the northeast corner the Maningory River flows eastward to the sea Mosquitoes are, of course, very numerous, and at places the rest-houses fairly hummed with their angry buzzing throughout the night The lake region is peopled by the Sihanaka tribe, a pleasant, docile type of native, who is said to be a mixture of Hova and Betsimasaraka (a coast tribe), with also a little Arab and European corsair blood

Beyond Imerimandroso the road enters a lonely mountainous region, climbs steeply over grassy or rocky mountain sides, and dips suddenly into narrow valleys in which are streams or swampy rivers, at Ambodivelatra it comes upon forested hills which continue to Marotandrano, where it makes a steep descent of 1,500 feet, thence it crosses open country to Mandritsara, a trading center and an important government post lying in a mountain-inclosed basin at an elevation of some 900 feet After the cold drizzle of the hilly plateau, the climate was hot and depressing

Here an easterly route was taken to the coast Leaving Mandritsara on April 26, Amanza, on the eastern limit of the basin, was reached that afternoon A start was made by moonlight at 2 o'clock the following morning, and by daybreak a steep ascent of nearly 2,000 feet was accomplished to the pass over Mount Mahalaina Thence the road descended over undulating hills to the Rantabe River at Andronadrona From

this point to the sea, a distance of some 80 kilometers, the scenery was very beautiful, the path winding up and down through the gorge in which flows the river with many rapids and cascades The forest is thick and tropical, with feathery, whiplike bamboos arching across the path and the cries of the lemurs echoing down the gorges

Coming down to the west coast of Antongil Bay at Rantabe, the path follows that coast to the capital of the province at Maroantsetra, thence follows the river gorges overland, across the pass, and down to the sea again at Antalaha From this point the coast was followed to the important port of Vohemar, a trading center exporting cattle and also precious wood, coffee, and vanilla Numerous rivers and streams empty themselves into the sea on this coast, and as in the south, though often only about 50 kilometers long, they open out into large estuaries which must be crossed by canoe Near Vohemar are large, grassy valleys in which feed large herds of cattle. Swampy hollows and the banks of rivers are usually converted into rice fields Nearing Diego the country becomes more mountainous, and fantastic limestone crags alternate with hills which are of volcanic origin The natives of this region are rather difficult to deal with at the villages, where it is necessary to bully the chief to obtain wood and water and food at the rest-houses

TABLE 13

No	Name	Date	Lat South		Long East	
		1921	°	′	°	′
1	Moramanga, *A*	Apr 10	18	57 1	48	12
2	Moramanga, *B*	Apr 11	18	56 8	48	14
3	Ambatondrazaka	Apr 14–15	17	49 4	48	24
4	Imerimandroso	Apr 17	17	25 9	48	34
5	Andilamena	Apr 19	17	00 9	48	34
6	Ambodivelatra	Apr 21	16	39 3	48	39
7	Andranokelilena	Apr 22	16	20 8	48	50
8	Mandritsara	Apr 25	15	50 8	48	49
9	Andronadrona	Apr 27	15	45 9	49	12
10	Rantabe	Apr 29	15	42 3	49	38
11	Maroantsetra	May 1	15	26 2	49	43
12	Manakabahiny	May 2–3	15	14 2	50	03
13	Antalaha	May 5	14	53 6	50	15
14	Andempona	May 6	14	35 6	50	10
15	Sambava	May 7	14	15 5	50	08
16	Anjala	May 9	13	52 8	50	06
17	Vohemar	May 11	13	21 2	49	59
18	Ampasimbaria	May 14	12	47 8	49	39
19	Boubavato	May 15	12	29 7	49	27
20	Diego Suarez	May 16–17	12	16 4	49	16

Antsirane, or, as it is popularly called, "Diego Suarez," situated at almost the extreme north end of the island, is a port of call for the mail steamers between Mauritius and France and, besides being a naval base, is the headquarters of the Messageries Maritimes coasting steamers, which, in normal times, leave about once a month for the south

Table 13 shows stations occupied, with dates and geographic positions, for other details, see Table of Results and Descriptions of Stations

(6) DIEGO SUAREZ DOWN WEST COAST

The coastal steamer *Dupleix*, with the Governor-General, who was making a tour of inspection, left for the west coast ports the day following our arrival at Diego Suarez on May 16, and thus time was only found to reoccupy the magnetic station established by Fave in 1887 On May 18 observations were made at Hellville on the island of Nossi Be, which is of volcanic origin and quite tropical in appearance. Next day, a few hours' delay at Analalava allowed another French station to be reoccupied, and

thence the journey was continued southward, calling at Majunga, Maintirano, and Morondava, and finally Ambohibe, where the vessel was left to continue her way to Tulear At Maintirano the anchorage is about 2 miles from the surf-bound coast, and there is no shelter The sea was quite rough, and for some hours no canoes could reach the ship and most of the passengers and all the cargo for this place were carried on to Morondava Ambohibe was reached on May 25, but disembarkment there would have been quite impossible had not a large schooner come out for cargo. The steamer anchored some 2 miles from shore and, though a few canoes got through the surf, they refused to accept the responsibility of landing a white man On the departure of the steamer, the schooner beat to and fro along the coast for two hours and finally got safely across the bar with a rising tide, the passage through the two lines of surf being quite thrilling During the voyage Monsieur H Garbit, the Governor-General, had been most interested in the objects of the work and at the various ports touched had asked the authorities to provide every facility for getting ashore without delay

The return journey to Majunga from Ambohibe was made first overland with carriers and the latter portion in a sailing lugger, during which period 16 magnetic stations were occupied On May 27, in the early morning, the carriers arrived from their villages, singing in unison as they trotted in a compact body over the sand, strong, lusty fellows all about 6 feet tall, with their hair dressed up into little balls stuffed with tallow and grease This mode of hairdressing is best appreciated on a hot day with a wind blowing from ahead, the traveler, seated in his "filanzana," then gets the full benefit of the stale greasy smell proceeding from the heads of the two front chair-bearers

The main route north leads via Manja, a post some 95 kilometers to the east, which was reached on May 29 Leaving the coast it was necessary to proceed south by a raised roadway through the mangrove swamps, and in so short a distance as 2 kilometers some 30 bridges were crossed During the day two arms of the Mangory delta were crossed by canoe, but on the second day the road soon entered thick mimosa scrub with clumps of giant baobab trees These latter are called by the natives "pearls of the forest" because they are higher than any other tree, but surely they are the ugliest trees of the world The fruit is rather tart and is appreciated on a long march when one is thirsty, while the trunk, shaped like a huge bottle, is nothing more than a mass of pulp which is valuable for the manufacture of paper In the north of the island the weather had been hot, but down in the south the nights were cold and the days sunny and pleasantly warm at this season

Continuing northward from Manja on May 30, the post of Mandabe was our next station, after a pleasant two-day journey over gently undulating country in which villages are not very numerous, but the people are friendly enough and make up for the crudeness of their rest-houses by the warmth of their hospitality Between Mandabe and Mahabo the same type of country is crossed and very few villages encountered, the people have large herds of cattle and, like their brothers of the south, consider it quite lawful to increase the size of these herds at the expense of their neighbors On the evening of June 4 the swampy bank of the Morondava River was reached, but, though its bed was very wide, the actual channel did not exceed 250 yards and was only waist deep From Mahabo to the coast at Morondava is a distance of 45 kilometers through the wooded valley of the river, which is crossed by a ford some 15 kilometers from the latter place Here villages are numerous, and a cart road has been constructed between the two places

Leaving the Morondava on June 9, a march of seven and one-half hours was made to the village of Tunitsi, and Belo, a trading center served by sailing-cutters from Morondava, was reached next evening Beyond Belo, after first crossing some low wooded hills covered with tombs of Sakalava chieftains, the path soon drops again to the typical

bush In one place the forest was particularly dense, and great excitement prevailed when the chair-bearers succeeded in shaking a young lemur off a sapling on which he had taken refuge. By evening of the 14th the Manambolo River was reached and safely crossed by a canoe which was as shallow as a hollowed-out plank It is necessary to kneel in a crouched-up position and to remain perfectly still during the crossing, the large crocodiles visible on the sandbanks not encouraging the traveler to move, even should he become cramped, as he is almost sure to do The night was spent at the village of Abohazo, where the mosquitoes were particularly ferocious It is at the head of the river delta, and next day, after a short forest stage, Benjavilo was reached by canoe Having reoccupied Père Colin's station of 1898, a glad departure was made from such a depressing spot, and after a stage by canoe the mangroves were left behind and a region of wooded hills entered as far as Cape Kimby, whence the long, curving beach was followed to Soahanina

TABLE 14

No	Name	Date	Lat South		Long East	
		1921	°	′	°	′
1	Nosi Be	May 18	13	24 2	48	18
2	Analalava	May 19	14	38 0	47	45
3	Ambohibe	May 26	21	21 1	43	31
4	Anosibe	May 27–28	21	24 2	43	41
5	Manja	May 29–30	21	27 7	44	20
6	Mandabe	June 1– 2	21	03 7	44	56
7	Mahabo	June 5– 6	20	23 1	44	38
8	Morondava, *A*	June 8	20	17 4	44	15
9	Moronava, *B*	June 8	20	17 7	44	15
10	Belo	June 11	19	42 2	44	32
11	Ankororiky	June 13	19	12 9	44	26
12	Benjavilo	June 15	19	00 0	44	13
13	Tondrolo	June 17	18	30 9	44	14
14	Ankatoky	June 18	18	11 1	44	07
15	Maintirano, *A*	June 20	18	03 8	44	03
16	Maintirano, *B*	June 21	18	10 4	44	03
17	Marofotsy	June 24	16	43 5	44	27
18	Pointe Sada	June 26	15	59 4	45	21
19	*Majunga, B*	June 30 July 1	15	43 4	46	19
20	Dzaoudzi, Comoro Islands	July 6	12	47 2	45	17

At Maintirano news was received that the steamer *Dumbea* was due to leave Majunga for Zanzibar on June 29 The overland journey from Maintirano is one of ten days' hard travel, and therefore it became necessary to continue by sea A missed connection with the steamer would have caused a delay of about two months, there being no other boat scheduled At Tambohorano a lugger with a cargo of hides and "pois du cap" was joined, and leaving at daylight next morning a fair wind carried us up the coast to Marofotsy, which serves as a landing-place for Besalampy, an administrative post some miles inland By evening the lugger ran up past Cap St André, which is very low and sandy and is given a wide berth by coastwise shipping This whole coast is very dangerous, the coral reefs and banks making navigation very difficult In places it is usual for the coastal steamers to anchor for the night, there being no light on the coast from Majunga to Cap Ste Marie On June 26 we were contending with tides and head winds into the bay at Pointe Sada, the following day was spent rolling, becalmed off Cap Tanjona A passage on the top of a cargo hatch of a small lugger, with no shelter from the Sun, is not recommended to tourists

Finally, on the morning of June 28, the day before the date set for the *Dumbea* to sail, we beat into the Bay of Bonbetora up to Majunga, thus ending a voyage of some 500 kilometers by sea The *Dumbea*, due the same day, was delayed and finally did not

leave until July 5, reaching Dzaoudzi on Mayotte Island in the Comoro group next day. A four-hour stay here afforded time to reoccupy the French hydrographic station, the Administrator very kindly placing his gig and rickshaw and some prisoners at our disposal. This act was typical of the courtesy and assistance rendered by the French officials throughout Madagascar.

On arrival at Majunga a telegram of welcome was received from His Excellency the Governor-General of Madagascar, Monsieur H. Garbit, who also by telegraph requested all "chefs de province" to give every assistance. Throughout the island all the administrators, military officers, and "chefs de postes" were most courteous and hospitable. It was this spirit of cooperation which made possible the completion of the work.

In all, 266 days were devoted to this work, 96 stations were occupied at a total field expense of $887, making the cost per station a little more than $9 and the time per station less than three days. The total distance traveled within the island was nearly 5,000 miles, of which more than one-half was by carrier caravan.

F. C. BROWN, ON MAGNETIC WORK IN EASTERN AFRICA, WESTERN AUSTRALIA, AND SOUTHERN ASIA, JULY TO DECEMBER 1921

On the completion of the Madagascar work, I left Majunga, July 5, 1921, and after a stop at Dzaoudzi, Mayotte Island, arrived at Zanzibar on July 8. The English port officer and the director of public works were very cordial and cooperated fully in the prosecution of my work there. The station was well marked and will be used by the Admiralty for testing compasses.

The landing regulations at Dar es Salaam are very strict, and one is supposed to cable in advance for permission to enter the colony. I was able to get ashore on a temporary pass, and through the courtesy of the chief secretary, I was provided with a written permit to observe in any part of the Tanganyika Territory. All of the officials were most courteous and manifested great interest in the work. As at Zanzibar, the station was well marked and will be used by the Department of Public Works.

On July 16, I left on an overland trip by rail to Ujiji, on the eastern bank of Lake Tanganyika. Professor J. T. Morrison traveled over the railroad so far as then constructed in 1909, and the line of the present railway was intersected at Tabora by the route followed by Dr. J. C. Beattie on his trip from Victoria Falls to Gondokoro in the same year. The present expedition was to determine secular variation by reoccupying stations of these earlier observers and at the same time to complete a chain of distribution stations across the continent by meeting the line of C. I. W. stations established by D. M. Wise, who reached the west bank of the lake in 1914 by way of the Belgian Congo.

The trip was made without incident, the stations shown in the appended list having been occupied, and Dar es Salaam was again reached on August 4. On August 6, I sailed for Mombasa, Kenya Colony. Professor Morrison traversed the railway line from Mombasa to Port Florence on Lake Victoria in 1909, observing at a number of stations, of which I was able to reoccupy 6. Those at Mombasa and at Nairobi were especially well marked for future reoccupations, the local authorities in each case having taken an active interest in their preservation. An unfortunate necessity for haste prevented taking additional time for securing local interest at other stations and discharging the accompanying obligation of supplying the data resulting from the work.

On the afternoon of August 24, I embarked for Aden and found the sea journey on a comfortable steamer most enjoyable and an agreeable change and rest after the hurried work in the interior of the past few weeks. Observations in the vicinity of the former station at Aden were made August 31. The Sun at this season was nearly vertical at

noon, and the weather was almost unbearably hot The usual diurnal-variation observations for the first of the month had to be omitted because of extreme risk of sunstroke during the exposure of such an extended series through the worst hours of the day I left Aden for Jibuti, Italian Somaliland, on September 3, after a delay of almost a day awaiting steamer's departure This was unfortunate, because thereby the connection with the biweekly train to Abyssinia was missed, resulting in an enforced stay of three days in Jibuti Observing conditions here are bad at this season Apart from the heat and glare, at 7 o'clock each morning a strong northwest wind arises which soon fills the air with blinding sand, observing is impossible while this lasts

TABLE 15

No	Name	Date	Lat South	Long East
		1921	° ′	° ′
1	*Zanzibar*, Zanzibar	July 10	6 10 1 S	39 11
2	*Dar es Salaam*, Tanganyika Territory	July 13–14	6 49 0 S	39 18
3	*Kilossa*, Tanganyika Territory	July 18	6 50 3 S	37 00
4	Dodoma, Tanganyika Territory	July 20	6 11 2 S	35 46
5	Saranda, Tanganyika Territory	July 21	5 42 9 S	35 01
6	Kilimantinde, Tanganyika Territory	July 22	5 51 4 S	34 59
7	Mazengo, Tanganyika Territory	July 23	5 52 8 S	34 59
8	Kigoma, Tanganyika Territory	July 25	4 52 8 S	29 38
9	Ujiji, Tanganyika Territory	July 26	4 55 1 S	29 42
10	*Tabora, A*, Tanganyika Territory	July 28	5 01 5 S	32 48
11	Tabora, *B*, Tanganyika Territory	July 29	5 02 3 S	32 49
12	Malongwe, Tanganyika Territory	July 31–Aug 1	5 26 7 S	33 39
13	*Ngere Ngere*, Tanganyika Territory	Aug 3	6 46 1 S	38 06
14	*Nairobi, A*, Kenya Colony	Aug 11	1 17 5 S	36 50
15	Nairobi, *B*, Kenya Colony	Aug 12	1 17 3 S	36 49
16	*Kisumu*, Kenya Colony	Aug 15	0 05 8 S	34 45
17	*Nakuru*, Kenya Colony	Aug 16	0 17 1 S	36 04
18	*Makindu*, Kenya Colony	Aug 19	2 16 8 S	37 49
19	*Voi*, Kenya Colony	Aug 20	3 23 8 S	38 34
20	*Mombasa*, Kenya Colony	Aug 23	4 03 3 S	39 41
21	*Aden, A*, Arabia	Aug 31	12 47 2 N	44 59
22	*Jibuti*, French Somaliland	Sep 5–6	11 34 2 N	43 09
23	*Hawash*, Abyssinia	Sep 8	8 59 0 N	40 13
24	*Addis Abeba, Legation*, Abyssinia	Sep 11	9 01 7 N	38 45
25	*Addis Abeba, Mission*, Abyssinia	Sep 12	9 01 7 N	38 47
26	*Dire Daoua*, Abyssinia	Sep 15	9 34 9 N	41 53
27	Aden, *B*, Arabia	Sep 23	12 49 8 N	44 58
28	*Colombo, A*, Ceylon	Oct 9	6 54 2 N	79 52
29	*Colombo, C*, Ceylon	Oct 10	6 54 2 N	79 52
30	*Watheroo Observatory*, Western Australia	Oct 23–26	30 18 9 S	115 53
31	*Cottesloe, A*, Western Australia	Oct 30	31 59 1 S	115 45
32	*Bunbury, A*, Western Australia	Oct 31–Nov 3	33 20 1 S	115 37
33	*Katanning*, Western Australia	Nov 5	33 41 3 S	117 34
34	*Narrogin*, Western Australia	Nov 7	32 55 8 S	117 10
35	*Geraldton*, Western Australia	Nov 10	28 47 0 S	114 37
36	*Carnarvon*, Western Australia	Nov 11	24 53 2 S	113 39
37	*Port Hedland*, Western Australia	Nov 15	20 18 8 S	118 35
38	*Broome, A*, Western Australia	Nov 17	17 58 4 S	122 14
39	*Derby*, Western Australia	Nov 18	17 17 8 S	123 38
	Straits Settlements			
40	*Singapore, Botanical Gardens*	Nov 27	1 18 9 N	103 49
41	*Singapore, Holland Road*	Nov 29	1 19 0 N	103 47
42	Singapore, Observatory	Nov 30	1 16 2 N	103 49

Three days are required to reach Addis Abeba from Jibuti by rail, stops for the night being made at Dire Daoua and at Hawash At these places the observations were made during the little available daylight morning and evening I had hoped to find time to complete the observations at Hawash on the return, but owing to a delay the place was not reached until after dark. As the railway was strongly guarded by troops because of an expected attack on the train by bandits, it would have been unwise to

attempt to work out on the plain by lamplight At Addis Abeba I was most hospitably received by the British minister and plenipotentiary, and considerable interest was shown by the officers of the legation in the work undertaken Heavy rains and storms marked the whole of the four-day stay at the capital, and the observations were made in mud ankle-deep September should be avoided by observers visiting this locality, the rains continuing until the end of the month The work in Abyssinia was hastened in the hope of returning to Aden to connect with a steamer leaving on September 19 for Fremantle, Australia Unfortunately the connecting steamer from Jibuti, instead of leaving on September 17, was delayed until the 20th, and soon after leaving port ran aground on a coral reef, narrowly escaping total loss Fortunately we were but a short distance off Zeila in British Somaliland, and a fleet of dhows sailed out and took off cargo to lighten the ship After 24 hours on the reef the captain succeeded in getting the vessel into deep water, and we arrived at Aden on September 22, too late for the Australian connections

The delay in Aden made possible the occupation of the British Admiralty station of 1909, which is on a saline flat across the harbor Though difficult of access, the magnetic values obtained will probably be more nearly normal than those obtained in the town, where all the C I W stations have hitherto been established The port officer placed a launch at my disposal and granted me every assistance

There being no further direct sailing for Australia for a month, I booked passage for Bombay, sailing on September 26 and going thence by train to Madras and from there to Colombo in time to connect with the steamer for Fremantle leaving on October 10, after making a reoccupation of stations established here by the *Carnegie*

I arrived at Fremantle on October 20 and at Watheroo on the 22d, where my instruments, which had been in continuous field use since May 1919, were compared with the observatory standards At the conclusion of the comparisons a few stations in Western Australia were reoccupied with Mr. Shearer of the observatory staff in order to furnish him experience in methods of field observations Returning to Fremantle, I took passage on the steamer *Charon* for Singapore The numerous stops of this vessel at ports in Western Australia furnished opportunity for hurried reoccupations of several more stations from Fremantle to Derby At Singapore both old stations were reoccupied, and a new station in a more favorable locality was established On December 7, I arrived at Canton, China, where my field work terminated July 1922

Table 15 shows the list of stations occupied, with dates and geographic positions, for additional details, see Descriptions of Stations and Table of Results

F C. BROWN, ON MAGNETIC WORK IN EASTERN CHINA, JULY AND AUGUST 1922

After an extended furlough at Canton, China, during which I had made observations each week at the magnetic hut on the grounds of the Canton Christian College, I left on July 11, 1922, for a brief trip in eastern China for the purpose of making a few reoccupations for secular variation on my way to Washington

Outrunning a threatened typhoon at Hongkong, we came soon into smoother weather and arrived at Shanghai on July 15. A brief call was made at the Zikawei Observatory for news of Père de Moidrey, who was then engaged in a magnetic survey of the coast of China at the request of the Government, which had been approached on the subject by the Japanese, who wished the data to make more complete the magnetic survey of Japan and its dependencies

The journey to Nanking was made by rail The original station of 1907 was now found to be within a few feet of a building, and a new position was secured on the recreation grounds of the Nanking University.

The journey to Hankow was by river steamer, whose stops at intermediate points were never long enough to permit going ashore for observations In spite of the heat, the journey up the mighty Yangtse was more enjoyable than sailing through the 1- or 2-mile flood of swirling brown water flowing through a flat country could be expected to be We reached Hankow on July 21, though the possibility of being able to do so was quite unexpected The region was peaceful, through the failure of military plans of the contending armies

The central provinces between Hankow and Peking, though not at war, were infested with brigands, and consequently there were large movements of troops on the railway Foreigners were advised to travel on the biweekly express, which carried sleeping and dining cars, but this was not possible because of the limited time at our disposal, and the journey was made on the daily trains, mostly monopolized by soldiers, and most dirty and uncomfortable in consequence. The tedium was relieved by the amusing manner in which the occupants of the combination first and second class coach were continually shifted. The Chinese officer of highest rank would take for himself most of the first-class space, turning all other officers into the second and third class cars After perhaps an hour of this comfort a superior officer would board the train and proceed to turn out the earlier occupant Being a foreigner, one is allowed to remain, and with such constant changes of traveling companions a journey does not lack interest

TABLE 16

No	Name[a]	Date	Lat North		Long East	
		1922	°	′	°	′
1	*Canton, As*	July 10	23	05 8	113	18
2	*Nanking*	July 17	32	03 8	118	48
3	*Hankow*	July 21–24	30	37 0	114	20
4	*Chengchow, A*	July 25	34	44 7	113	42
5	Chengchow, *B*	July 26	34	44 8	113	42
6	*Peking, 1916*	July 29	39	52 5	116	23
7	*Peking, 1907*	July 31–Aug 1	39	57 3	116	25
8	*Kalgan*	Aug 4	40	51 2	114	51
9	Kakioka Observatory	Aug 13–18	36	13 8	140	11

[a] All of the stations are in China except No 9, which is in Japan

After a stay of two days at Chengchow, where we were entertained by the American Baptist mission, Peking was reached on July 27 Here both the 1907 and the 1916 stations were reoccupied The former had been plowed over and the marker removed The stone at the latter had been removed and a new one inscribed in Chinese and English was placed by cooperation with the director of the Observatoire Central de Peking, who expressed a purpose to make observations there annually There are no magnetic and few astronomical observations made at the observatory at the present time, though there is a modern meteorological equipment A magnetic observer is being trained for this position at Lukiapang, and it is to be hoped that the critical political and financial situation in China may not defeat the plans for the establishment of magnetic work here

Kalgan was visited on August 4 There is now a frequent automobile service between Kalgan and Urga by the telegraph road, and it is possible to continue by car to the Siberian Railway

The journey from Peking to Tokyo was undertaken by rail via Mukden and Seoul, there being no suitable sailing from Tientsin in early August It had been announced in Peking that the Manchurian war lord, Wu Pei Fu, had consented to allow trains to run through to Mukden, making the journey to Tokyo in four days Delays causing a missed connection and a washout extended this time by two days more, and Tokyo was not reached until August 12

A very cordial welcome was extended by the authorities of the Central Meteorological Observatory, and arrangements were made to proceed the next day to Kakioka, where intercomparisons were made with the observatory standards and with the electric magnetometer of Professor Watanabe These were completed, and on August 18 the party returned to Yokohama The opportunity of living among the Japanese entirely in Japanese style was much appreciated On two nights of our stay there was the observance of an annual religious festival, with street illumination, dances, and ceremonies that added to the interest and delight of the visit

The return to Washington was by way of Vancouver and Minneapolis, and thence to Washington, where a final comparison of instruments, which had been in the field since early in 1919, was made on September 7 to 11

Table 16 shows the stations occupied, with dates and geographic positions, for additional details, see Table of Results and Descriptions of Stations

D G COLEMAN, ON MAGNETIC WORK IN THE SAMOA, ELLICE, AND TOKELAU ISLANDS, MAY TO SEPTEMBER 1921

In accordance with the Director's instructions of May 21, 1921, I left Washington on May 23, 1921, for Apia, Samoa Islands, where I was to take up the work of reoccupying a series of stations in Australasia and among the Pacific Islands for secular-variation data, under the direction of Dr H M W Edmonds, stationed temporarily at the Apia Observatory We arrived at Apia on June 15, and the remainder of the month and most of July was spent in getting comparisons at the observatory, making comparison observations in connection with the standardization of the instruments aboard the *Carnegie*, which came to port while I was there, and in making plans for travel among the islands

By special arrangement with representatives of the London Missionary Society, I secured passage on their ship, the *John Williams*, on a tour of the Ellice and Tokelau Islands As the port of Apia was closed because of an epidemic of measles, I obtained permission to go to Pago Pago, American Samoa, where I remained under medical observation until August 15, when the vessel was scheduled to arrive The trip to Pago Pago from Apia was made in a small native launch, and though it is only 65 miles, it consumed 18 hours to cover the distance against a stiff head wind On August 22, I received a message from Dr Edmonds that the *John Williams* was being held at Sydney because of influenza among her native crew. I immediately secured permission to go aboard the naval ship *Fortune*, which was leaving that night for her monthly copra trip to Manua Island Arriving at Manua the following day, I succeeded in achieving a safe landing through the surf with the instruments, and with the help of the only white inhabitant of the island, a German trader, I located the eclipse station of 1911 The latter was a difficult task, as the hurricane of 1915 had practically destroyed every tree and building, however, from the ruins and the information from the natives, I succeeded By spending the night in a native hut, and beginning work at daybreak, I completed my program in time to return to the ship with the last load of copra The *Fortune* made no other stop long enough to secure further observations Lieutenant Kehler, in command of the vessel, showed me every courtesy, even to premitting me to share the only cabin with him

On Saturday, August 31, the *John Williams*, 17 days overdue, arrived at Pago Pago, and we sailed that night for the Ellice Islands, arriving at Funafuti Atoll on the afternoon of September 6 This island and others of this and neighboring groups are of low coral formation, having at no point an altitude greater than about 10 feet above the sea There are groups of coconut palms, an occasional banana plant, and a few native huts The British commissioner and a trader, both of whom live on Funafuti Atoll,

constitute the white population of the Ellice Islands. The visit of the mission ship being an annual event, and the vessel being the only one to visit some of the islands, we were accorded an interesting reception. As we came into view of one of these islands, we were met by scores of grass-attired natives in long canoes hollowed from tree trunks. Rowing round and round the ship, they sang and shouted all the time, until we were near enough to stop, when they left their canoes and swarmed up the sides and all over the ship. Those who had no canoes would swim out to meet the ship, sometimes a distance of 2 miles or more.

At each island stop the missionaries went ashore, and with the local native missionaries, held a church service and conducted the annual school examination, the latter consuming several hours, depending upon the number of pupils to be examined. My work had to be adjusted to that of the missionaries, who never knew in advance of landing how long they would remain. I always went ashore with them, and it was no easy matter to get ashore with the instruments safe and dry. The process of landing usually consisted of about a 20-minute row in the whale-boat from the ship to the outer edge of the reef, where we would transfer to native canoes as the only type of boats able to successfully ride the enormous surf. Once through the surf we made a second transfer, this time to the back of a native who would bear us through the rough knee-deep coral reef to the shore. From my position on the back of a native I had a good view through the clear water of the brilliant coral formations and the hundreds of young octopi squirming into the crevices at our approach. At some of the islands I was unable to carry out the complete program of observations on account of the short time it took for the missionaries to complete their work. I reoccupied as closely as possible all the stations established in 1915 in the Ellice and Tokelau groups, and returned to Pago Pago on September 24.

TABLE 17

No.	Name	Group of Islands	Date	Lat. South	Long. East
			1921	° ′	° ′
1	*Apia*, Samoa Observatory	Samoa Islands	June 5–July 19	13 48.4	188 14
2	*Pago Pago*, American Samoa	Samoa Islands	Aug. 12–16	14 17.0	189 19
3	*Tau Island*	Samoa Islands	Aug. 23–24	14 13.4	190 28
4	*Funafuti Island, B*	Ellice Islands	Sep. 6–17	8 31.2	179 11
5	*Nukufetau Island*	Ellice Islands	Sep. 7	8 01.7	178 20
6	*Vaitupu Island*	Ellice Islands	Sep. 8	7 29.2	178 41
7	*Nui Island*	Ellice Islands	Sep. 9–12	7 15.0	177 10
8	*Nanomana Island*	Ellice Islands	Sep. 13	6 17.6	176 20
9	*Nanomea Island*	Ellice Islands	Sep. 14	5 40.4	176 08
10	*Niutao Island*	Ellice Islands	Sep. 15	6 06.6	177 21
11	*Funafuti Island, A*	Ellice Islands	Sep. 16–17	8 31.5	179 11
12	*Nukulailai Island*	Ellice Islands	Sep. 19	9 22.1	179 50
13	*Atafu Island*	Tokelau Islands	Sep. 21	8 32.2	187 29
14	*Fakoafu Island*	Tokelau Islands	Sep. 22	9 23.0	188 45
15	*Swains Island*	Tokelau Islands	Sep. 23	11 03	188 55

Table 17 shows the stations occupied, with dates of occupation and geographic positions; for further details see Descriptions of Stations and Table of Results.

D. G. COLEMAN, ON MAGNETIC WORK IN THE FIJI ISLANDS, SOLOMON ISLANDS, AND NEW GUINEA, SEPTEMBER 1921 TO JANUARY 1922

The mission ship, the *John Williams*, was to remain in port at Pago Pago for several days, and as the little launch on which I had come over from Apia was again in port, I decided to return with her to Apia in hopes of catching the monthly New Zealand steamer for the Fiji Islands. This was a fortunate decision, and I was able to sail, the evening

of my arrival, for Suva, after a hurried conference with Dr Edmonds, and attention to passport arrangements, fumigation, banking, and mail details necessary before departure

En route to Suva, I was able to stop at Nukualofa, Tongatabu Island, of the Tonga group, September 30, where I had the assistance of two surveyors of the Department of Public Works, who volunteered to have a permanent marker made for the station and the position made a part of the public records Neiafu, Vavau Island, was visited, but Lifuka had to be omitted, as it was under quarantine at the time I arrived at Suva, Fiji Islands, on October 5, and there learned that the connecting steamer for Sydney would arrive in two instead of four days, as I had been informed in Apia In the short time available, I was able to reoccupy the station known as Dr Klotz's Station, despite the continual rain, and on the following day, starting at 5 o'clock in the morning, I went to the Hospital Hill Station with my equipment The rains had washed the hillside until it was too steep to allow a foothold, and the station marker had been washed out and was found lodged in the débris near the foot of the hill After wading and slipping about for an hour, hoping to find a spot for an approximate reoccupation, I was forced to take refuge from a tropical downpour As the rain continued, the attempt was abandoned The following morning I left Suva for Sydney, Australia A stop at Lautoka enabled me to establish a new station about 80 miles west of Suva

On arrival at Sydney on October 14, I interviewed all the shipping and missionary agencies which are in communication with or have transportation facilities among the western island groups of the South Pacific, and decided to take passage on the Burns, Philp and Company steamer, the *Mindini*, on October 29, for Tulagi, in the Solomon Islands The interval before the sailing of the vessel allowed opportunity for reoccupying the station at the Red Hill branch of the Sydney Observatory Magnetic work has been suspended at this station, owing to shortage of funds and because of the destruction of the observing hut by the falling of a very large tree some months before On October 19 the Government astronomer, Dr W I Cook, drove out to the Red Hill station with me, and with the assistance of the observer-in-charge, we managed to get the tree clear of the pier, which was found to be undamaged, though the hut which had protected it was demolished On the following days I secured observations on the pier with some difficulty, climbing over the tree trunk throughout the observations.

After a hurried trip by rail to East Maitland, I embarked on the *Mindini* and arrived at Makambo, Solomon Islands, on November 7 The reoccupations of the stations of 1915 were rather difficult, due to the limited time the steamer remained at each port, and this time was never known in advance, as it was determined by the amount of copra to be loaded Generally we anchored off an island at daybreak, and I went ashore with the first copra boat, climbing down a rope ladder with my instruments Once ashore, some time was required to relocate the previous station before work could be started In no case did we stay more than one day in a place About an hour before the last boat returned to the ship, I was notified, so that work was always being done against time Working in this way, and handicapped by the terrific tropical rains, I reoccupied 6 of the former stations in the Solomon Islands, and returned to Tulagi in time to connect with the *Melusia,* another steamer of the same owners, for Rabaul, Bismarck Archipelago, on November 27

I arrived at Rabaul on December 3, having made stops at several ports, only one of which permitted opportunity for work An arrangement was made to visit the Admiralty Islands, but on boarding the steamer, announcement was made that the sailing had been postponed three days This delay would have made it impossible to return in time to connect with the *Marsina* for New Guinea, and the arrangements for the trip were canceled On December 14, I took passage for Samarai, New Guinea, where I arrived two days later. Here I learned that the vessel used in 1915 to reach the New Guinea stations

had been taken out of the service since I had left Sydney, on account of the failure of the gold mines and of the low price of copra The only means of getting to these outlying stations would be by small sail or gasoline launches, and these were not plentiful My attempt to charter a small boat met with no success. I did manage to get a very poor boat to make the Suau Island station, 30 miles distant from Samarai A man who had waited at Samarai a month for a chance to get over to the island accompanied me as passenger and bore one-half the cost of the trip, which was an extremely uncomfortable one and required three days In general, the cost of chartering boats, when they can be obtained at any price, is excessive, and greatly out of proportion to the value of the work that can be accomplished by them

I finally learned of what seemed to be an exceptionally fortunate opportunity of reaching stations along the north coast of the island, to the mouth of the Mombare at the boundary of German New Guinea, but what in the sequel came near bringing my expedition to disaster A 6-ton launch from which the owner, a pearl fisher, had mysteriously disappeared, was held by the Government pending investigation, and in the meantime was chartered for short trips A miner returning to his properties some distance up the Mombare River would use the launch to transport his supplies and send it back with its crew of native boatmen Returning with it, I could make the desired stops and detours, and it seemed too good an opportunity to miss. Therefore, on Christmas morning, I went aboard with my contribution to the cargo. The launch being the first boat in several months, carried the Government mail; she also carried 15 natives belonging to the miner, 4 native boatmen, one native cook, and the miner and myself, the only white men, and every inch piled high with general cargo. I knew it would be no pleasure trip, but I did not expect the boat to be so crowded. However, I threw my mattress on top of a couple of boxes, and proceeded to hang on all the way to Mombare The weather was rough, and the engine in charge of the native boy gave no end of trouble, consuming far more fuel than the old miner had expected There were numerous reefs along the coast and no lights, so travel was possible only during daylight. It was at daybreak on December 29 when we started the ascent of the swampy tropical river Hardly had we entered the mouth of the river when we became lodged on the sand, a wait of five hours brought high tide, and we proceeded until nightfall, when we camped in midstream, where the sand flies and mosquitoes came through our nets and made sleep impossible The following day the launch ran aground a second time on a sand-bar, and this time all efforts to pull her off were of no avail. We put the native boys off in the river and made them pull, which they did in mortal fear, as the river fairly teemed with alligators, in fact one boy was kept on top of the launch, rifle in hand, ready to shoot any menacing alligator. At dark we were still fast on the bar, and it looked as though we should remain until the next flood would raise the water and deliver us, which at this season might be a month or more We were 67 miles from the nearest white man, in a country none too friendly, where the natives deserted their villages and took to the bush on our approach In such a manner I spent New Year's Eve in the middle of the Mombare River.

During the night the unexpected happened A severe rain passed over us and along the mountains back of us, so that at 3 o'clock in the morning I felt the launch make a slight lurch, and, crawling forward from my perch on the boxes, by the light of a hurricane lamp I saw great masses of foam, and then great logs and débris coming swiftly down the river. I called the crew, and before dawn we were out of our predicament and on our way, arriving at Tamata Junction on New Year's Day The next day the cargo had been discharged, and the launch turned over to me for the return trip to Samarai, 350 miles away.

The outward trip had been exciting at times, uncomfortable always, the return was a continual gamble with fate, with odds all against us. I had quite naturally accepted the judgment of those familiar with the conditions, in the matter of supplies and fuel for the trip. Without attempting to place the blame, the fact remains that I was expected to get that launch back with only 5 cases of benzine and kerosene, whereas it had required 15 to bring us out. There were no stores or known places where I could secure fuel, there was no regular sail fitted to the launch. Should I be able to reach Buna Bay, the nearest white settlement, there was no regular communication, and overland travel through the jungle, filled with hostile tribes, was out of the question. To remain was equally impossible. There was but one thing to do, and that is what we did.

At daybreak we drifted with the current down the river to the sea and headed for Buna Bay. The sea was rough, and we had constant trouble with the engine. Fortunately, we reached Buna Bay, the first white settlement, on about the last drop of our fuel. The settlement consists of 5 white men, a magistrate, a miner, and 3 recruiters of native labor for the plantations. When I arrived at dark, the place had all the appearance of having been deserted. After entering several empty huts, I reached the Government hut, and there I found four-fifths of the population still in the grip of a New Year's celebration. The miner was absent, and I made a native lead me to his hut, 4 miles inland, where I found him very ill with a fever. He chanced to have 2 tins of benzine which he sold me, and feeling like a heartless wretch, I took the fuel, and left him to his suffering, lying there unattended in his dirty, leaky thatch, and hurried back to Buna Bay. I now had fuel enough so that with good luck I should be able to reach Cape Nelson, 60 miles farther down the coast, where there is a Government station.

Starting at about 2 o'clock, and being so low in fuel, the boat crew determined to steer the shortest course directly across the bay. When 20 miles out the engine broke down and could not be repaired before dark. Then a storm arose. I had the crew rig a sail out of an old tarpaulin, and a sort of jib out of my observing tent. The storm continued, darkness came on, we had no compass, but by use of my small pocket compass read by the light of the flashes of lightning, we retained a general sense of the direction of the land. The boat seemed to roll almost completely over, and at all times I had to hold on with both hands to keep from being washed or thrown overboard. A sudden twist of the boat and the sail boom snapped square off, and we were completely helpless, without engine, without sail, and a strong wind blowing off shore carrying us farther out into a sea where vessels never pass and hope of rescue was impossible. One of the drunken recruiters at Buna Bay had forced himself upon me as a passenger and now became violently seasick, the boat boys, though good sailors, were terrified and crawled into the corners to hide, and I had to force them to take down the tent, which was a failure as a jib, and rig a sea anchor, I also had them drop our tiny anchor in the hope it might snag a reef and hold us until our engine could be repaired. There was nothing more to be done but to hold on until morning, when the engine *must* be fixed. After seven long hours, the storm abated, and at daybreak land was just visible. It took five hot steamy hours' work in the engine cabin for me and the engine boy to get one cylinder to work, and on that we chugged into Cape Nelson at dusk, a second time completely out of fuel.

The settlement at Cape Nelson consists of two white men, a magistrate and an old trader, neither of whom could supply me with sufficient fuel to carry me to Samarai. I learned of an old beach comber whose launch had been taken for debt, and on the chance of getting a little from him, I walked through the bush to his hut. From him I secured one tin and a gourd full of benzine, his entire supply. The magistrate drained the tank in his launch to add to my supply, but warned me that the trip to Samarai could not be accomplished on the fuel on hand, with the engine in its present condition.

My passenger was now sick with fever and was indifferent whether he went or stayed The engine boy told me that he sometimes made the engine run on leaner mixture of kerosene and benzine, but that it would not always work There was no telling when a boat would arrive at Cape Nelson, certainly not for a month, and even then it might not be able to supply me with fuel So against the judgment of the Cape Nelson men I set out at daybreak for Samarai, more than 200 miles distant Once more using the tent as a jib, and using a two-thirds mixture of kerosene and benzine in an engine designed to burn it half and half, we just managed to get into Samarai harbor on January 9; we did not have fuel enough to reach the wharf

At Samarai there was still no possibility of getting passage to the remaining stations, so I decided to go to Port Moresby and visit the points in that vicinity I was informed, however, that Port Moresby was under a strict quarantine for measles, and that if I went there I should have to suffer a 21-day strict quarantine, and thus miss the next Sydney steamer I therefore could do nothing but go direct from Samarai to Sydney, and this I did, arriving in Sydney January 19, 1922

TABLE 18

No	Name	Continent or Group of Islands	Date	Lat South	Long East
			1921	° ′	° ′
1	*Neiafu*	Tonga Islands	Sep 30	18 39	186 01
2	*Nukualofa*, Togatabu Island	Tonga Islands	Oct 3	21 07 6	184 47
3	*Suva, Dr Klotz's Station*	Fiji Islands	Oct 5	18 08 4	178 26
4	Lautoka	Fiji Islands	Oct 8	17 36 6	177 26
5	*Red Hill, A*	Australia	Oct 20	33 44 5	151 04
6	*Red Hill, B*	Australia	Oct 21	33 44 5	151 04
7	*East Maitland*	Australia	Oct 23	32 45 5	151 35
8	*Makambo Island*	Solomon Islands	Nov 7	9 04 9	160 12
9	Aola	Solomon Islands	Nov 9	9 31 2	160 30
10	Rere, Guadalcanar Island	Solomon Islands	Nov 10	9 33 4	160 39
11	*Faisi Island*	Solomon Islands	Nov 16	7 04 4	155 53
12	*Binskin's Station*	Solomon Islands	Nov 17	7 47 5	156 35
13	*Salicana Island*	Solomon Islands	Nov 18	7 26 8	157 40
14	*Tulagi*	Solomon Islands	Nov 23–25	9 06 6	160 11
15	*Gizo*	Solomon Islands	Nov 15, 19 Dec 1	8 06 0	156 51
16	*Rabaul*	Bismarck Archipelago	Dec 5– 8	4 12 7	152 12
17	*Samarai, A*	New Guinea	Dec 16–17	10 37 4	150 40
18	*Suau Island*	New Guinea	Dec 20	10 42 2	150 15
19	*Samarai, B*	New Guinea	Dec 22	10 37 3	150 40
20	*Kwato Island*	New Guinea	Dec 24	10 37 3	150 38
			1922		
21	Tamata Junction	New Guinea	Jan 1	8 22 1	147 50
22	*Mambare*	New Guinea	Jan 2	8 04 3	148 01
23	*Buna Bay*	New Guinea	Jan 4	8 40 3	148 25
24	*Cape Nelson*	New Guinea	Jan 6	9 03 3	149 17
25	*Ipoteto Island* (Secondary)	New Guinea	Jan 7	9 38 0	150 01

Table 18 shows the stations occupied, the dates of occupation, and their geographic positions, for additional details see Descriptions of Stations and Table of Results

D G. COLEMAN, ON MAGNETIC WORK IN AUSTRALIA, NEW ZEALAND, COOK ISLANDS, SOCIETY ISLANDS, MARQUESAS ISLANDS, AND TUAMOTU ARCHIPELAGO, JANUARY TO AUGUST 1922

On my return to Sydney from the Solomon Islands and New Guinea, I received a letter informing me that I should thereafter report direct to the Office as my own chief of party, instead of to Dr Edmonds as before, and also instructions under date of September 12, 1921, to cooperate with Dr J. M Baldwin, Government astronomer, at the Melbourne Observatory, in instrument and station comparisons necessary to a transfer of the magnetic observatory from Melbourne to the new site at Toolangi I at once

informed Dr. Baldwin that I should be in Melbourne about February 1, and ready to assist in such program as might be agreed upon.

En route to Melbourne I reoccupied 4 stations of 1911 and 1913 in New South Wales. At Melbourne a program of approximately simultaneous observations was arranged at the Melbourne and the Toolangi stations, so that a comparison of instruments was obtained and at the same time a satisfactory station difference necessary for a transfer of the observatory absolute observations. At the same time the recording instruments were installed at the new location.

After a conference with Captain Edward Kidson, formerly in charge of the magnetic survey of Australia for the Carnegie Institution of Washington, I decided to carry out the work in New Zealand first, and then take up the Society Islands and neighboring groups. Accordingly I returned to Sydney on February 28, and arrived in Auckland, New Zealand, on March 6. At Christchurch I met Mr. H. F. Skey, in charge of the magnetic observatory there, and in consultation with him arranged a list of stations in the North Island and the South Island for reoccupation. Owing to the infrequent train service on the New Zealand railroads at that time, the number of stations was necessarily smaller than I should have desired otherwise, as I wished to finish in time to connect with the steamer from Wellington for Tahiti, sailing April 11. The month of March proved a very unsatisfactory one for work, as there were but two really good days for observations, the others being invariably rainy or cloudy.

I arrived at Papeete, Tahiti, Society Islands, on April 19, 1922, and after attending to official formalities, and having reoccupied the C. I. W. station there, I received instructions by cable to visit such island groups in the vicinity as I was able. I found an opportunity to take passage for the Marquesas Islands on a very small copra schooner of about 60 tons.

The schooner left Papeete on April 29, with a crew of 4 natives and a Tahitian captain, 4 native women passengers, and myself. The captain was the only one of the natives who spoke English, and his vocabulary was very limited. There were no accommodations for the passengers, and we were all put together in the one small cabin, but the bilge stench and the copra fumes made it impossible to stay in the room, so I camped on the hatch on deck; there was no room to exercise, and the boat rolled so that I had to hold to something all the time. At noon the hot tropical sun blazed down on us so that our luncheon of native food could not be enjoyed. The old captain had been gathering copra for many years, but always in the same island group, where a knowledge of navigation was not essential. It took him about three hours to work out a simple longitude, so I took his sights and worked out his positions by the aid of my pocket chronometer. This pleased the old seaman so much that he gave me his cabin and he went forward and slept in the forecastle with the crew. This was very fortunate for me, as we ran into some very bad weather, the deck being awash for four of the ten days required for the trip.

En route we stopped at Tikei, a small uninhabited island of the Tuamotu group, and this being the last land seen before reaching the Marquesas, the crew and I went ashore through the heavy surf and onto the coral reef, where they speared fish and I got an inclination observation. On May 9 we arrived at Atuona, Hiva Oa Island, Marquesas Islands, this being at present the seat of government. It had been my intention to remain with the schooner while she gathered copra among the islands and thus reach Nukahiva, where the former C. I. W. station was made in 1907. However, her agents instructed the captain to tie her up at Atuona on account of the continued low price of copra. There were no hotels in Atuona; however, I was able to secure quarters in the rear room of a native store. There was nothing I could do but wait the chance arrival of a trade schooner, which might not be for one, two, or even three months.

This was on May 10, and by rare good fortune a trade schooner put in on May 13, I promptly made arrangements to take passage with her as she traded among the Tuamotu Islands en route to Tahiti. We were supposed to sail on the 15th, but mere tropical inertia delayed us until the 17th, when after a few hours at sea we were forced by heavy weather to return to Atuona to remain until the 19th This schooner, though small, was somewhat larger than the one I had come out on and was fitted up with a small store of overalls, hats, axes, calico, perfume, and trinkets to trade with the natives for copra As I was the only white man and the only passenger, the captain cleared one of the shelves of merchandise and gave it to me as a bunk

We arrived at Puka Puka Island on May 25, and here the captain took 42 native passengers, men, women, children, with dogs, cats, turtles, pigs, goats, fishnets, and other belongings, to Fakaina Island, where we arrived on May 29 After long delays because of calms, the captain decided to omit the remaining islands and steered direct for Tahiti, where we arrived on June 9 I had spent the entire month of May in reaching a few islands of the Marquesas and Tuamotu groups To reach by trading-schooners the remaining island where repeat observations were desired, would require, in the present condition of the copra market, more than six months' time

TABLE 19

No	Name	Continent or Group of Islands	Date	Lat South		Long East	
			1922	°	′	°	′
1	*Goulburn*	Australia	Jan 25	34	45 8	149	43
2	*Harden*	Australia	Jan 26	34	33 6	148	22
3	*Wagga Wagga*	Australia	Jan 27	35	06 2	147	23
4	*Albury*	Australia	Jan 28	36	05 1	146	55
5	Toolangi	Australia	Feb 3–20	37	33 4	145	29
6	*Melbourne*	Australia	Feb 20–24	37	49 9	144	58
7	*Auckland*	New Zealand	Mar 8	36	51 7	174	46
8	*Rotorua Gardens*	New Zealand	Mar 10	38	09 3	176	16
9	*Eketahuna Domain*	New Zealand	Mar 15	40	39	175	43
10	*Christchurch, Jarrah Peg*	New Zealand	Mar 19	43	31 8	172	37
11	*Clinton*	New Zealand	Mar 22	46	12 6	169	26
12	*Kingston*	New Zealand	Mar 25	45	19 6	168	45
13	*Queenstown*	New Zealand	Mar 27	45	02 4	168	42
14	Cromwell	New Zealand	Mar 30	45	02 6	169	14
15	Roxburgh	New Zealand	Mar 31 Apr 1	45	33 9	169	19
16	*Mount Victoria*	New Zealand	Apr 5	41	18 7	174	47
17	*Avarua*	Cook Islands	Apr 16	21	11 5	200	15
18	*Point Fareuta*	Society Islands	Apr 24	17	31 5	210	26
19	Papeete (Secondary)	Society Islands	Apr 25	17	31 8	210	27
20	Tikei Island	Tuomotu Archipelago	May 3	14	57	215	26
21	Atuona	Marquesas Islands	May 10–12	9	48 6	220	58
22	Puamau	Marquesas Islands	May 20	9	46 6	221	07
23	Puka Puka Island	Tuomotu Archipelago	May 25–26	14	48	221	10
24	Fakahina Island	Tuomotu Archipelago	May 29	15	57 8	219	51
25	Angatau Island	Tuomotu Archipelago	May 31	15	49 4	219	07
26	*Point Fareute*	Society Islands	June 12–13	17	31 5	210	26
27	*Avarua*	Cook Islands	June 19– July 3	21	11 5	200	15
28	Avarua, *C* (Coral Beach)	Cook Islands	July 10–15	21	11 4	200	15
29	Avarua, *B* (Tekeu)	Cook Islands	July 17	21	11 4	200	15
30	*Auckland*	New Zealand	Aug 3– 7	36	51 7	174	46

The Tuamotu Islands are similar to the Ellice Islands—mere coral atolls, surrounded by high red coral reefs, making landings extremely difficult and very dangerous. I had several good drenchings, but always managed to reach the reef with my instrument safely. At every island one or more copra boats were capsized in attempting to make the reef Only the semiannual mail steamer and occasional trading schooners go to

the Austral Islands, and as I had been instructed to reach the assigned station in Queensland, Australia, in time for the total solar eclipse of September 22, I did not attempt to visit that group I therefore went back by steamer to Rarotonga in the Cook group As sailings from there to New Zealand are monthly, I should have to wait there a month for the sailing of about July 15 I hoped in this interval to find an opportunity to visit the Manihiki group In this hope I was disappointed, as the interisland schooners were at that time all out and would not return in time to make another trip before I should have to leave for Australia I learned that a government steamer was about to leave for one of the nearer islands, and I presented a letter of introduction obtained for me by the Christchurch Observatory to the resident commissioner and asked permission to go along The permission was refused, and I was forced to content myself with repeated diurnal-variation observations until the next sailing for Wellington On the arrival of the *Maunganui* from Wellington to San Francisco, I had the pleasure of meeting the Director, Dr L A Bauer, returning from an inspection trip after attending the meeting of the International Geodetic and Geophysical Union at Rome

Table 19 shows the stations occupied, the dates of occupation and the geographical positions For additional details see Descriptions of Stations and Table of Results

D G. COLEMAN, ON MAGNETIC WORK IN QUEENSLAND, AUSTRALIA, INCLUDING SPECIAL OBSERVATIONS DURING THE TOTAL SOLAR ECLIPSE OF SEPTEMBER 20, 1922

I arrived from Rarotonga at Wellington, New Zealand, on July 30, 1922, having met on board Dr Campbell and Dr Moore of the Lick Observatory eclipse party I left Auckland for Sydney on August 11, arriving in Sydney on the 15th, and had the pleasure of again meeting Dr Baldwin, of Melbourne, and the Reverend Dr Piggott, returning from their visit to Washington On arrival at Sydney, plans for the work of the September eclipse were discussed with these gentlemen and with Professor Von Willer of the Sydney University

TABLE 20

No	Name	Date	Lat South	Long East
		1922	° ′	° ′
1	*Werris Creek*	Aug 22	31 21 0	150 39
2	*Tenterfield*	Aug 23	29 04 1	152 02
3	*Brisbane*	Aug 26–30	27 27 1	153 02
4	*Roma*	Sep 2–5	26 34 3	148 48
5	*Charleville, A*	Sep 8–12	26 24 4	146 14
6	Coongoola (Eclipse)	Sep 15–22	27 39 2	145 54
7	*Cunnamulla*	Sep 30–Oct 4	28 04 3	145 42
8	Charleville, *B*	Oct 6	26 24 5	146 14
9	*Tambo*	Oct 8	24 53 1	146 16
10	*Jericho*	Oct 10	23 35 7	146 08
11	*Emerald*	Oct 12	23 30 5	148 10
12	*Rockhampton*	Oct 16–18	23 21 8	150 30
13	*Goondiwindi, A*	Oct 24	28 33 0	150 18
14	Goondiwindi, *B*	Oct 26	28 32 5	150 18
15	*Red Hill, B*	Nov 6	33 44 5	151 04

After occupying stations en route, I arrived at Brisbane, where I made extended observations and completed arrangements for time signals to control the special eclipse observations By special courtesy of the officers in charge, I was to have the exclusive use of the telegraph line from Brisbane to my eclipse station at Coongoola, 500 miles distant, for 10 minutes on September 19, 20, and 21 This plan was modified later by the decision of Mr Fraser, the State time-observer, to organize a party for eclipse photographic observations at a station about 10 miles west of Coongoola Signals were received by

telephone from Mr Fraser's party, who had a sidereal chronometer from the Brisbane Observatory, rated nightly by star observations Unfortunately, an accident to this chronometer later has introduced a little uncertainty as to the final correction Crowds of people came to view the eclipse by special trains, but they were kept entirely away from my station by the police from Cunnamulla

Following the eclipse, the month of October was spent in reoccupying widely distributed stations in Queensland Going first to Charleville, I went overland across a desert country to Tambo by automobile, and thence by mail coach to the railway at Blackall, where I took a train to Jericho Following the railway eastward, I went to Emerald, Rockhampton, thence southward through Maryborough to Brisbane No work was possible at Maryborough, as by an error of the railway officials my observing tent and instrument tripods had been taken on to Brisbane After locating the lost articles, I went to Goondiwindi to make a reoccupation of the station where Mr Kidson had made his eclipse observations, and arrived at Sydney on October 28

Table 20, shows the stations occupied, with dates of occupation and geographic positions; for additional details see Descriptions of Stations and Table of Results

D G COLEMAN, ON MAGNETIC WORK IN NEW CALEDONIA, LOYALTY, NEW HEBRIDES, AND LORD HOWE ISLANDS, NOVEMBER 1922 TO JANUARY 1923, AND IN AUSTRALIA, JANUARY TO APRIL 1923

I sailed from Sydney on November 9, 1922, on the French mail steamer, the *Pacifique*, for Noumea, New Caledonia, where I arrived November 13 On the following day I joined the 100-ton copra-gathering steamer for Lifu Island of the Loyalty group, stopping en route at Maré Island I arrived at Lifu Island on the 17th and was courteously given accommodation at the French Protestant mission, as there were no hotels on the island The missionary in charge was no stranger to my work, as he had entertained Mr Brown on his African expedition in the Cameroun I rejoined the copra steamer on her return and two days later arrived again at Noumea

I next took passage with the monthly mail steamer for Paagoumene on December 1, where I arrived on the 4th, proceeding later by the same vessel to Bourail, arriving three days later The stops en route by this vessel were too short to permit work at any of the intermediate points From Bourail, which is the terminus of the only road in New Caledonia, I went overland to Noumea. On this visit to Noumea I spent time explaining my work to the local officials, as the suspicion that I was a spy had been communicated to the police I was permitted to leave on the 16th on the *Pacifique*, which was sailing for the New Hebrides By remaining aboard as this vessel gathered copra I was able to visit three of the 1915 stations However, the stay at Port Sandwich was curtailed, owing to bad weather, no passengers being permitted to go ashore, and the vessel returned to Fila on December 22, when I disembarked, and on the 29th took passage on the British steamer *Makambo* for Sydney En route I was able to stop for observations at two stations, at the third, Norfolk Island, the stop was less than one-half hour and no work was possible I arrived in Sydney on January 14, 1923

Traveling by rail to Melbourne, Victoria, I took passage across to Launceton, Tasmania, and went thence by rail to Latrobe, where I made the first reoccupation on January 22

Between my arrival in Tasmania on January 20 and my departure on Feburary 10 I reoccupied 5 stations The weather was very unfavorable, cloudy and rainy nearly the whole time Time was lost in searching for the precise location of the former station markers, while the extended program of observations called for in the new instructions for class I and class II stations makes the time at each station much longer than hitherto.

After making two reoccupations in Victoria, I traveled by train to Adelaide, South Australia, and called on Government Astronomer G F Dodwell with reference to comparisons between my outfit and those at the observatory there After inspecting the sites of the former stations at Adelaide, a station for the intercomparisons was selected at Mount Lofty, 14 miles distant The comparisons were carried out between February 26 and March 7, Mr A L Kennedy, assistant astronomer, and former magnetic observer in this Department, using the observatory instruments At the conclusion of the comparisons, I made observations at the old station in the Botanical Park, while Mr Kennedy observed at Mount Lofty, in order to obtain the station difference

The standardization observations completed, and Port Lincoln reoccupied as a class II station, I took the weekly train on March 21, from Port Lincoln to Ceduna, the present terminus of the railway This section was suffering from a severe drought, so that at Ceduna the amount of drinking-water per person was limited The journey required two days to cover 268 miles, over a newly constructed road on which only second-class accommodations were provided It was the roughest railway journey I ever made, the jars and jolts at times making it positively dangerous

The long class I program was completed here under very trying circumstances The time was limited, as the work must be finished in time to join the weekly automobile mail truck westward The diurnal-variation observations in horizontal intensity were made on March 26, the day before my departure, in a very severe dust-storm The station was on a sand-hill, where it received the full force of the storm It was necessary to keep the tent tightly closed, and even so the instrument was soon covered with a coating of fine red desert sand It became very hot and close in the tent, so that between readings I had to lie face down on the sand until time for the next reading Fortunately, toward evening the wind shifted and the dust cleared so that I could get a mark reading It was undoubtedly the most strenuous observation day I have ever experienced

On the following day at daylight I left Ceduna by mail car for Yalata Head Station, a large sheep ranch, 100 miles distant over a semi-desert country While there I was the guest of the manager of the ranch, and reoccupied the station of 1911 I was now more than a week's overland journey from Adelaide, with no way of proceeding farther into the desert The best way seemed to be overland to the water station at Ooldea on the transcontinental railway, and directly to Perth and Watheroo, reaching Eucla and other stations along the line on the return This was further rendered advisable because of an accident to the pocket chronometer To take it back to Adelaide would involve great loss of time, and to await a replacement from Watheroo on requisition by telegraph was impossible, as there was no accommodation to be had along the railway while awaiting its arrival

On March 28 I hired a Ford automobile and undertook the sixth trip ever made by motor across the desert from Fowler's Bay to the line of the Transcontinental Railway The distance is 119 miles, and cost slightly less than a shilling a mile, which was very low, considering the risk involved and the condition of the track The driver had a companion accompany him, as he would not venture on the return trip alone Food and blankets, as well as shovels and picks, were provided Arrangements were made for a searching party to look for us if not heard from at the end of four days The track led through dense mallee scrub, and at times over perfectly level, treeless sand-plains No human being was seen in the entire distance, though, despite the complete absence of water, lizards and snakes, as well as dingoes and foxes, were seen along the route We had to dig the car out of the sand on three occasions, and many times we had to push Ooldea is merely a water-tank stop on the railway, and here I was guest of the water-tender while waiting the arrival of the triweekly train for the west

I reached Perth on Easter Sunday, and on Tuesday arrived at the Watheroo Observatory, where I immediately took up the comparison of my instruments with those of the observatory standards, thus completing the indirect comparison of the C I W standards with those at Melbourne and at Adelaide

Table 21 shows stations occupied, with dates of occupation and geographic positions, for additional details see Descriptions of Stations and Table of Results

TABLE 21

No	Name	Group of Islands or Continent	Date	Lat South	Long East
			1922	° ′	° ′
1	*Maré Island*	Loyalty Islands	Nov 15	21 32 6	167 53
2	Lifu Island	Loyalty Islands	Nov 17–21	20 46 8	167 09
3	*Noumea*	New Caledonia	Nov 28–30	22 16 3	166 28
4	*Paagoumene*	New Caledonia	Dec 4– 5	20 29 2	164 11
5	*Bourail*	New Caledonia	Dec 9	21 37	165 29
6	Ringdove	New Hebrides	Dec 19	16 38	168 10
7	Luganville	New Hebrides	Dec 20	15 32	167 09
8	*Fila*	New Hebrides	Dec 23–28	17 44 3	168 19
			1923		
9	Hog Harbour	New Hebrides	Jan 1	15 09	167 07
10	*Lord Howe Island*	Lord Howe Island	Jan 12	31 31	159 04
11	*Latrobe*	Australia	Jan 22	41 14 8	146 27
12	*Longford*	Australia	Jan 23–26	41 35 9	147 08
13	*Hobart, D*	Australia	Jan 29	42 52 2	147 21
14	*Sorell*	Australia	Jan 30– Feb 2	42 47 6	147 33
15	*Southport, A*	Australia	Feb 4– 7	43 25 9	147 01
16	*Ararat*	Australia	Feb 14–15	37 17	142 57
17	*Border Town*	Australia	Feb 16–20	36 18 5	140 46
18	*Mount Lofty, A*	Australia	Feb 26– Mar 9	34 58 5	138 42
19	*Mount Lofty, B*	Australia	Feb 26– Mar 7	34 58 5	138 42
20	*Adelaide, Botanical Park*	Australia	Mar 8	34 54 8	138 36
21	*Port Lincoln*	Australia	Mar 19–20	34 42 6	135 52
22	*Ceduna*	Australia	Mar 23–26	32 08 2	133 36
23	*Yalata Head Station*	Australia	Mar 28	31 56 3	132 23
24	*Ooldea*	Australia	Mar 30	30 27 5	131 48
25	*Watheroo Observatory*	Australia	Apr 5–10	30 18 9	115 52 6

D G COLEMAN, ON MAGNETIC WORK IN SOUTHERN AND EASTERN AUSTRALIA, APRIL TO JUNE 1923

Upon completion of the comparisons of magnetometer-inductor No 24 with the standards at the Watheroo Observatory, I went by rail to a station called Mile-Post 632 on the Transcontinental Railway Here I joined a camel wagon party for the trip across the desert to the Eucla telegraph station, situated 78 miles south, on the seacoast. The wagon was drawn by four camels in charge of two native black Australians, who, with myself, constituted the party

The country traversed is perfectly flat salt-bush desert, not a tree being seen in the entire distance The novelty of the mode of travel furnished interest to offset the wearisome monotony of the landscape and relieved the tiresome jolting of the wagon At night the dingoes circled about the camp-fire and howled continuously from dark to daybreak The blackfellows lay down behind their windbreaks of salt-bush and went quickly to sleep, after the first night, I did likewise At Eucla, a telegraph relay station given prominence on all maps of Australia, there was a total of 14 inhabitants Class I observations were made here April 17 to 20, and then I immediately returned to Mile-Post 632, where observations were made on April 24 Continuing eastward by the tri-weekly train to Tarcoola, a defunct mining town in South Australia, I reoccupied the

station of 1914 and went on to Port Augusta, where I again met Mr A L Kennedy and made further comparison observations with the dip needles of the Adelaide Observatory instruments

Leaving Petersburgh and Farina to be reoccupied by Mr Kennedy, I went northward on the South Australian Railway to Marree (formerly Hergott Springs) and then took the fortnightly train to the rail terminus at Oodnadatta, which was designated as a class I station The proposed trip to Nilpinna was necessarily omitted on account of the remote situation requiring elaborate preparation and excessive expense Fortunately, I escaped a week's waiting for return of the train by joining the caretaker of a special stock-train for Adelaide After a tedious 32-hour ride in a box car, I reached Petersburgh, where I connected with the passenger train for Broken Hill and Menindie, New South Wales, and thence by mail coach to Wilcannia The journey of 200 miles from Wilcannia to Bourke by auto mail-coach proved to be very slow and trying The region had been suffering from a severe drought, there having been no rain for more than two and one-half years, and the roads had been reduced to deep beds of dust under the heavy camel and bullock traffic which radiates into the "backblocks" from Bourke, the railway terminus When we were about half-way between Wilcannia and Bourke, fortunately for the country but unfortunately for travelers, the long drought broke, 167 points of rain fell, and the roads became impassable The auto-coach bogged time and time again We waded through mud about 4 miles to a deserted wool-shed and spent the night there, covered with some pieces of old woolsacks we found in the place, but not until we had killed five great centipedes which had also sought the shelter of the wool-shed The British Royal Mails have to move despite weather conditions, and in seven hours we succeeded in moving about 10 miles, when more rain fell and we were forced again to take shelter, this time in a bogged camel-wagon With the rain came the Australian winter We were muddy, wet, and cold, and I was without bedding, however, I spent that night, June 5, in the same bed with a very generous though extremely dirty Afghan camel-driver in his wagon The next day the three of us stood about a campfire knee-deep in the cold mud and waited for the liquid road to dry Shortly before dark a new high-powered coach came out from Bourke, where the rain had been less, and I transferred to the new car and arrived at Bourke on the morning of June 7, having been nearly a week on the track

TABLE 22

No	Name	Date	Lat South	Long East
		1923	° ′	° ′
1	*Eucla*	Apr 17–20	31 43 3	128 53
2	Mile-Post 632	Apr 24	30 49 4	128 25
3	*Tarcoola*	Apr 26	30 43 1	134 25
4	*Port Augusta, A*	May 1–5	32 29 7	137 46
5	Port Augusta, *B*	May 1–5	32 29 7	137 46
6	*Marree*	May 9	29 39 4	138 03
7	*Oodnadatta*	May 12–15	27 33 1	135 28
8	*Broken Hill*	May 20–23	31 57 8	141 27
9	*Menindie*	May 26	32 23 9	142 26
10	*Wilcannia*	May 30–31	31 33 7	143 23
11	*Bourke*	June 7–9	30 04 9	145 57
12	Narromine	June 12	32 15	148 12
13	*Dubbo, B*	June 14	32 14 9	148 37
14	*Dubbo, A*	June 15	32 14 3	148 35
15	Wellington	June 16	32 33 6	148 56
16	*Red Hill, B*	June 25	33 44 5	151 04

On the rail journey eastward toward Sydney I stopped for observations at Narromine, Dubbo, and Wellington, paying particular attention to the distribution in the

vicinity of Dubbo, where the observations of 1913 indicated a pronounced local magnetic disturbance The weather at the last six stations was very unfavorable for observations due to the breaking of the long drought, each day being either rainy or cloudy After a further and final reoccupation of the Red Hill station near Sydney, I obtained passage on a coastal steamer sailing on June 26, 1923, for Mackay, Queensland

Table 22 shows the stations occupied, with dates and geographic positions, for additional information, see Descriptions of Stations and Table of Results

D G COLEMAN, ON MAGNETIC WORK IN QUEENSLAND AND NORTHERN AUSTRALIA, JULY TO OCTOBER 1923

The series of stations outlined for reoccupation in the northern portions of Australia were found to be much more difficult of access than ten years previous at the time of the first visit of C I W. observers Many of the towns have disappeared, the train service where there are railroads is less frequent, coastal service has been curtailed, and opportunities for getting about by other irregular means have very greatly diminished I went from Sydney by coastal steamer as far as Mackay and Townsville, and thence by rail westward to Cloncurry, the rail terminus, making stops for observations at Hughenden and Richmond I next traveled northward by horse-coach for 300 miles to Normanton on the Gulf of Carpentaria The journey required five days, during which 70 horses had been used Only six ranch houses had been passed on the way, and at each of these the approach of the coach could be distinguished when a dozen or more miles distant across the barren, treeless plain on account of the huge cloud of red dust raised by the five coach horses

TABLE 23

No	Name	Date	Lat South	Long East
		1923	° ′	° ′
1	*Mackay*	July 5– 7	21 08 8	149 11
2	*Townsville*	July 10–13	19 14 6	146 50
3	*Hughenden*	July 16–18	20 50 4	144 12
4	*Richmond*	July 20	20 43 8	143 09
5	*Cloncurry, A*	July 24–27	20 42 4	140 30
6	Cloncurry, *B*	July 28	20 42 4	140 30
7	*Normanton*	Aug 6– 9	17 41 4	141 06
8	*Normanton, Secondary*	Aug 8	17 41 4	141 06
9	*Croydon*	Aug 14	18 13 1	142 15
10	*Forsayth*	Aug 16	18 35 1	143 38
11	*Cairns*	Aug 20–24	16 56 0	145 46
12	*Cooktown*	Aug 30– Sep 1	15 28 6	145 17
13	*Thursday Island, B*	Sep 7–10	10 34 5	142 13
14	*Katherine River*	Sep 16	14 26 1	132 17
15	*Pine Creek*	Sep 17	13 49 6	131 51
16	*Darwin*	Sep 21–24, Oct 2	12 26 7	130 50
17	*Batchelor*	Sep 26–27	13 03 6	131 03
18	*Point Charles Lighthouse*	Oct 4	12 23 4	130 39

From Normanton to Croydon, a defunct mining town, the journey was by the weekly railway train, and the 250 miles overland to Forsayth was made in the Royal Mail auto truck From Forsayth a weekly railway train was again available to Cairns, where I arrived and made observations August 20 to 24 From Cairns I went to Cooktown by coastal steamer. As the latter is a deserted mining town, I was fortunate in making connection with the monthly mail steamer for Thursday Island, where I arrived on September 7 I was able in the limited time to complete class I observations and continue westward with the mail steamer to Darwin, Northern Territory, arriving on

September 15 Immediately on my arrival I availed myself of an opportunity to go on a special race train to Katherine River, the rail terminus, September 16, and returned to Pine Creek by the same train and made the necessary observations while the train halted for the rural race meeting at that place This opportunity was particularly advantageous, as the regular service is fortnightly After the regular class I work at Darwin, I took the scheduled train to Batchelor, joining the train again on its return Aside from the trip to Point Charles Lighthouse, it was not practicable to attempt other excursions from Darwin on account of the distances involved and the lack of transportation, which present much greater difficulties than at the time of the previous visit in 1914

Table 23 shows the stations occupied, with dates and geographic positions, for additional details, see Table of Results and Descriptions of Stations

D. G COLEMAN, ON MAGNETIC WORK IN THE DUTCH EAST INDIES AND FARTHER INDIA, OCTOBER TO DECEMBER 1923

On October 16, I left Port Darwin via the S S *Marella*, arriving at Batavia, Java, on October 24, where intercomparisons were begun between C I W magnetometer-inductor No 24 and the instruments of the Royal Magnetical and Meteorological Observatory at Weltevreden Dr W. A Visser made the observations with the Observatory instruments during the comparisons on October 25 to November 1 In order to improve an opportunity of visiting Borneo and Celebes afforded by the sailing of the Royal Dutch Navigation Company S S *Meyer*, I left Batavia by rail on November 3 for Sourabaya and on the following day from that port took passage for Bandjarmasin, Dutch Borneo, where a close reoccupation of the Dutch East Indian survey station of 1907 was made. I returned on the same vessel to Sourabaya and there joined the S S. *Schrodercroon* for Makassar, Celebes, at which place another Dutch East Indian station was reoccupied From Makassar I returned by boat to Batavia and completed the intercomparison observations.

TABLE 24

No	Name	Date	Latitude	Long East
		1923	° ′	° ′
1	*Weltevreden* (*Batavia*), *Java*, *A*, *C*, *D*, and *E*	Oct 25–Nov 1	6 11 S	106 50
2	Makassar, Celebes	Nov 8– 9	5 08 0 S	119 25
3	Bandjermasin, Borneo	Nov 16–17	3 19 7 S	114 35
4	*Weltevreden*, *A*, *C*, and *D*	Nov 22–23	6 11 S	106 50
5	*Singapore*, Straits Settlements	Nov 27–29	1 16 2 N	103 49
6	Jesselton, British North Borneo	Dec 6, 10	5 58 4 N	116 09
7	Sandakan, British North Borneo	Dec 8	5 51 7 N	118 25
8	Kudat, British North Borneo	Dec 9	6 53 3 N	116 50
9	Labuan Island, British North Borneo	Dec 11–12	5 16 5 N	115 17
10	*Phantiet*, Indo-China	Dec 28–30	10 56 2 N	108 03
		1924		
11	*Saigon*, Indo-China	Jan 2– 4	10 46 5 N	106 42

From Batavia I next went to Singapore, Straits Settlements, where I arrived on November 25 and obtained class II observations at the C I W station of 1922 On December 1, I sailed from Singapore on the S S *Delhi* for Sandakan, British North Borneo After making observations for a class II station on December 8, I returned to Singapore via the S. S *Selangor* and established en route stations at Kudat, Jesselton, and Labuan, British North Borneo.

From Singapore I next went by steamer to Saigon, French Indo-China, where I arrived on Christmas Eve, 1923 After securing necessary permits from the French authorities, I proceeded by rail to Phantiet, where the C. I. W. station of 1912 was

closely reoccupied as a class II station The reoccupation of Saigon as a class II station completed the field work assigned, and I returned to Washington via Suez and Europe, arriving on March 1

Table 24 shows the stations occupied, with dates and geographic positions, for additional information, see Descriptions of Stations and Table of Results

P H DIKE, ON MAGNETIC WORK IN ISLANDS IN MEDITERRANEAN, AND MEDITERRANEAN COUNTRIES OF ASIA, JUNE TO SEPTEMBER 1922

The instrumental outfit consisted of magnetometer 12, marine earth-inductor 7, and galvanometer 30X in separate cases, 2 chronometers and 2 watches, and the usual accessories These instruments were sent to me at Robert College, Constantinople, by the Director, who had taken them with him to Rome, Italy, and the chronometers were brought over under the personal supervision of Mr N O Meisenhelter, second officer of the steamship *Ossa*, from Philadelphia

My instructions of March 7, 1922, gave a somewhat wide choice of routes to be followed in securing well-distributed reoccupations of the stations established by W H. Sligh in 1910-11 Military operations in Asia Minor rendered it inexpedient to attempt inland work from Constantinople, and the route toward Palestine and Syria by sea was chosen On account of a state of war existing between Greece and Turkey, there were many obstacles to travel in these regions, and a great many passport visas, letters of introduction from high commissioners and other officials to officers in command in the field had to be secured As assistant and interpreter I engaged Mr Robert Pasche, a Swiss, as no native of any of the eastern countries would be allowed to enter all the countries I hoped to visit As a graduate of the Engineering School of Robert College, and on account of his familiarity with the languages of the Near East, he was particularly well fitted for the position

Having made observations at Rumeli Hissar, near Robert College, as a class I station, we went on June 17 to Dardanelles, where we found that all landmarks of the previous occupation had been destroyed by military operations At Smyrna, the next port, a large amount of time was consumed in official formalities required by martial law Here we found the station marker had been removed by the natives for fear it might have been an attempt of foreigners to establish a claim to the ground A personal letter from one of the Greek staff in Constantinople to the military governor was the means of securing for us permission to go inland to Afiumkarahissar (or Afion Kara Hissar), and other special courtesies We were met by officers with automobiles and taken to quarters specially requisitioned for our use, furnished with local transportation, and interpreters who also acted as guards for our apparatus during the night As the station was almost within sight and hearing of the firing at the front line, these provisions for our comfort and safety were highly appreciated The destruction of Smyrna and the intervening territory did not occur until some time after our departure

After our return to Smyrna, and a short trip to Aidin, we sailed for Piræus, going thence to Kephisia, near Athens, where Mr Sligh made observations in 1911 On July 12 we took passage from Piræus to Naxos where observations were made on the site of an ancient temple, the cylindrical marble base of an old column serving as platform for the tripod. Having missed the steamer that should have taken us to Crete, and no sailboat owner being willing to make the trip, we got over to Santorin, and from there hired a sloop to take us across to Candia, Crete The harbor at Santorin is the crater of an ancient volcano with an active cone in the center When we were ready to start it became dead calm in this harbor, and great difficulty was experienced in getting out against a very light head wind which had finally arisen We reached Candia July 18, and carried out the class I program The observations were carried out under excellent

conditions, but with the handicap of a hotel in which it was impossible to sleep, the observing-tent being a preferable lodging

At the conclusion of the observations at Candia, it was found that no boat was available for Rhodes for two weeks, and further, for some reason Mr Pasche's passport was missing and it would be impossible for him to proceed without one, so it was advisable to return to Athens Before the new passport could be secured, the last steamer for Rhodes for two weeks sailed, and I proceeded without my assistant, arriving July 29 After the work was completed I proceeded to Alexandretta The stops of steamer were not long enough to permit observations, and furthermore, I did not have Turkish (Kemalist) visas At Larnaka, Cyprus, a longer stop was made, and it was possible to reoccupy the station there

From Alexandretta to Aleppo I shared the expense of a Ford car with an Armenian traveling salesman The trip was a slow one, as we had at least 12 blow-outs on the way, and once were forced into the ditch by a camel We arrived at Aleppo on August 11, and I carried out the class I program in most exhausting heat, the temperature in the tent mounting nearly to 50° C

TABLE 25

No	Name	Date	Lat North	Long East
		1922	° ′	° ′
1	*Rumeli Hissar*, Turkey	June 8, 12–13	41 05 3	29 03
2	*Dardanelles*, Turkey	June 19	40 06 8	26 25
3	*Smyrna*, Turkey	June 23–24	38 27 8	27 12
4	*Afiumkarahissar*, Turkey	June 30, July 1	38 46 0	30 36
5	*Aidin*, Turkey	July 6	37 51 3	27 50
6	*Kephisia*, Greece	July 11	38 04 3	23 50
7	Naxos, Naxos	July 14	37 06 4	25 23
8	*Candia*, Crete	July 19–21	35 19 3	25 09
9	*Rhodes*, Rhodes	Aug 1– 2	36 26 6	28 12
10	*Larnaka*, Cyprus	Aug 7	34 53 7	33 38
11	*Alexandretta*, Syria	Aug 10	36 34 8	36 11
12	*Aleppo*, Syria	Aug 14–16	36 13 7	37 08
13	*Homs*, Syria	Aug 18	34 43 9	36 41
14	*Damascus*, Syria	Aug 23–24	33 30 3	36 19
15	*Jerusalem*, Palestine	Sep 1– 2	31 47 8	35 13
16	*Rumeli Hissar*, Turkey	Sep 16	41 05 3	29 03

The trip from Aleppo to Damascus was made by rail, stopping over 24 hours at Homs for observations At Damascus there was a little delay in starting the work on account of a fever brought on by too much sun Further delay was caused by non-arrival of needed supplies On August 30 I started for Jerusalem by rail, and was obliged to spend one night at Haifa, arriving the next day, when regular observations were made, followed on the succeeding day by the diurnal-variation observations in declination

As my time for returning to Robert College was growing short, it was decided to go on immediately to Beyrut without stopping at Haifa for observations, traveling by public automobile up the coast All through Syria and Palestine at present there are automobile lines, using principally American cars of the heavier models The ride from Haifa to Beyrut is a rough one, the first part being along the sandy beach or in the river bed with the wheels hub deep in water Both the instruments and myself had a serious jolting, and my face bears the scars of a collision with a rib of the automobile top when we went at full speed over a culvert Arriving at Beyrut, I learned that the steamer on which I had engaged passage to Constantinople had advanced its sailing date two days, and I was obliged to omit observations and go aboard at once.

Fortunately the steamer did not stop at Smyrna, or we should have become involved in the evacuation of the Greek refugees, which was then beginning, and the trip would have been extended indefinitely As it was, I arrived in Constantinople just in time to take up my duties at the beginning of the college year

All the stations occupied on this expedition except that at Naxos were repeat stations In occupying them I had traveled about 4,200 miles, an average of about 280 miles per station, the mean time per station being about 6 days The field expense per station was about $65 Every possible courtesy had been extended to me in spite of the disturbed condition of the countries where the work was done, particular mention being deserved by Generals Vlahopoulos and Tricoupis, who were involved in the disaster at Smyrna soon after our departure

Table 25 shows the magnetic stations occupied, with dates of occupation and geographic positions, for additional details see Descriptions of Stations and Table of Results

H W FISK AND J T HOWARD, ON SPECIAL MAGNETIC WORK IN BERMUDA, JULY TO SEPTEMBER 1922

We left Washington on the evening of July 2, 1922, en route to Hamilton, Bermuda, for the purpose of conducting some special investigations of the magnetic anomaly in those islands, as well as to secure secular-variation observations at points where observations had been made in 1907 and 1910 Two complete instrumental outfits were provided for the work, consisting of magnetometer 17 with marine earth-inductor 7, as the first, and universal magnetometer 14 with Schulz earth-inductor 6 with galvanometer, as the second outfit Universal magnetometer 14 was supplied with needles for both dip and intensity to use if occasion required In addition to these instruments, compass-variometer 2 was taken for rapid survey for changes in horizontal intensity within limited fields.

A base-station was first occupied near Mont Royal in Paget West, across the harbor from Hamilton, where the party made its headquarters. The first task thereafter was the recovery and exact reoccupation of five primary stations, selected and permanently marked in 1907 The recovery in each case was believed to be sufficiently exact to meet the requirements, though recourse was had to measurements in the case of two of the stations A large number of secondary stations had been occupied in 1907, and the recoveries of these were doubtful, though some had been described in sufficient detail to make recoveries very close One of the purposes of the expedition was to study secular changes during the intervening 15 years and to determine, if possible, whether changes were identical at all points regardless of the absolute values of the elements, that is, whether there had been any variation in the character of the anomaly The results of this study point very strongly to such a change having occurred with respect to the declination, but with respect to the other elements there is less ground for such a conclusion

For studying the question whether any measurable difference in diurnal variation exists between two stations located in regions having respectively high and low values of that element, simultaneous observations were carried on by the two observers over the daylight portions of several days at points so selected as to satisfy that condition. For the study of the diurnal changes in declination the stations chosen were at the agricultural experiment farm southeast of Hamilton and at Black Bay in Southampton, near Gibbs' Hill Lighthouse Simultaneous observations were made August 22, 24, and 26 For the study of the changes in inclination a similar arrangement was made between Agar's Island and Spectacle Island These observations were made with the two earth-inductors at 20-minute intervals September 4 and 5 The greatest range in horizontal intensity was found to exist between the station on Agar's Island and near a villa called Rockaway,

west of Little Sound, in Sandy's Parish Observations were made at these points September 6 and 12 If a difference in range of variation exists, it is too small to be detected by the methods used

It is generally assumed that the soils of the islands have all been derived from the decomposition of the coral rocks with the additions of vegetable decay, since there are no visible outcrops of volcanic matter As the soil in places seems to be the source of considerable local disturbance, some experiments were conducted to determine whether the coral rock itself contained sufficient iron in the magnetic form to be appreciable The compass-variometer was taken August 2 to a place where a quantity of quarried coral stone was available in sizes convenient for easy handling The instrument was kept in a fixed position and the stones placed in piles of various arrangements around it, the reading being recorded for each arrangement Another test for the same purpose was made in a rock-cut locally known as Khyber Pass The cut is very narrow, being from 8 to 10 feet wide at the bottom, and with nearly vertical sides about 25 feet high at the deepest part The soil at the top is very light and apparently not in sufficient quantity to have any magnetic effect Observations were made August 18 at the bottom and at the top of this crevasse for comparison Opportunity to determine whether the rock in large masses produced any shielding effect was afforded by the limestone caves present in considerable number While some of these have been exploited for commercial purposes and the owners were unwilling that they should be used for experiments of the sort, there were others not so commercialized and which had the advantage of freedom from iron fixtures of various kinds present in the commercialized caves In three of these, observations were made at the bottom and again as nearly as possible vertically over the same point, at the surface In none of these experiments was it possible to ascribe any effect to the iron components of the coral rock

TABLE 26

No	Name [a]	Date	Lat North	Long West
		1922	° ′	° ′
1	Mont Royal, *A*	July 10–11	32 16 68	64 47 59
2	*Spectacle Island* or *Hunt's Island*	July 13, Sep 2	32 15 58	64 50 23
3	Mont Royal, *C*	July 20	32 16 68	64 47 57
4	*Agar's Island*	Aug 5	32 17 61	64 48 70
5	*St George*	Aug 14	32 23 12	64 40 90
6	*Nonsuch Island*	Aug 15	32 20 86	64 40 03
7	*Ireland Island*	Aug 19	32 19 40	64 50 50
8	Black Bay	Aug 21,29	32 15 31	64 50 63
9	Agricultural Station	Aug 23	32 17 47	64 45 94

[a] All these stations except Nos 5, 6, and 7 were occupied for diurnal variation on other days than those listed

A condition was found on the western shore of Little Sound in Sandy's Parish, extending from Evans' Bay to King's Point, that seemed to warrant detailed study During September 10 to 15 a large number of observations, covering this region along the sound and for a considerable distance inland, were made with the compass-variometer, supplemented at points of greatest interest with observations with the earth inductor, from the variometer observations it was possible to sketch the lines of equal horizontal intensity It was found that the field changed with a fair degree of uniformity through about 1,400 gammas in the distance of about one-half mile along this shore, revealing a center of maximum intensity near Rockaway and one of minimum intensity near Evans' Bay (See special report on compass-variometer in Volume V of this series) A similar survey was made of a very small area near the base-station at Mont Royal, where there was evidence of an intense local field and no reason to suspect any artificial source of disturbance.

Cordial cooperation was received in the prosecution of the work by the civil, military, and naval authorities in the colony, as well as by private citizens in positions of influence Conditions for carrying out such work are favorable during the summer months because of the small amount of rainy weather and the moderate but refreshing winds The smaller number of visitors and tourists during those months also makes the limited means of transportation more readily available and securing suitable boarding accommodations less difficult.

The list of secondary stations occupied, together with their geographical coordinates and the values obtained for the magnetic elements, is given in the Table 26 (a detailed discussion of the results and of the magnetic anomalies will be published later) The primary stations, with dates of observations and adopted geographic coordinates are given in this table For additional details, see Table of Results and Descriptions of Stations

R. H GODDARD, ON MAGNETIC WORK IN CANADA, LABRADOR, AND GREENLAND, JUNE 1923 TO SEPTEMBER 1924

In accordance with preliminary instructions dated June 8, 1923, and instructions dated June 20, 1923, I was assigned under the command of Dr Donald B MacMillan as a member of his North Greenland Expedition of 1923 to 1924 to take charge of the magnetic survey and magnetic and electric observatory work undertaken by the Department of Terrestrial Magnetism in cooperation with the Expedition.

The instrumental outfit and equipment was as follows (*a*) Instruments for observatory use, including magnetograph 5 complete with declination, horizontal-intensity, and vertical-intensity variometers, quadrant electrometer 19284 and registering apparatus with silver-chloride batteries and appurtenances for recording the electric potential of the atmosphere, (*b*) instruments for field and standardization use, including Dover dip circles 241 and 242 for determining magnetic declination, inclination, and total intensity, and bifilar electrometer 20 for potential-gradient observations, with necessary appurtenances, including two marine chronometers, watches, tents, etc

The expedition left Wiscasset, Maine, on June 23, 1923, on the auxiliary schooner *Bowdoin* after all stores and equipment had been received on board and stowed for sea. The *Bowdoin* proceeded from Wiscasset, Maine, to Sydney, Nova Scotia, where magnetic observations were made in Victoria Park. Water, fuel oil, and fresh meats were taken on board, and the vessel proceeded on her way northward through the Strait of Belle Isle and up the Labrador coast as far as Jack Lane's Bay, where Mr Abraham Bromfield, the interpreter for the expedition, was taken on board Various stops were made in the passage from Sydney to Jack Lane's Bay, owing to adverse weather conditions Opportunity was afforded for making magnetic observations at Red Bay, Battle Harbor, Gready, and Hopedale From Jack Lane's Bay the vessel was squared away for the southern end of Greenland, the intention being to water up at Godthaab On the evening of July 28 the vessel dropped anchor in Godthaab Havn after a very favorable passage from Labrador Magnetic observations were made on the following day Mention should be made of the deep impression made on most of the members of the expedition by the little Danish-Eskimo settlement of Godthaab The affairs of government are administered by the Danish authorities in such a manner that prosperity, good health, and happiness reign in this little settlement of 200 Eskimos. The village is spotlessly tidy and the natives are clean, healthy, and happy-faced.

From Godthaab the *Bowdoin* proceeded to Cape York, stopping one night in a small harbor near the entrance to South Strom Fiord to take on water and to repair a broken bowsprit On August 2, 1923, the Arctic Circle was crossed, and that night it was 10 o'clock before the Sun disappeared below the horizon A meridian altitude of the Sun at lower culmination was obtained shortly after midnight of August 5, ship time. Despite

the fact that this altitude was very small (2° 35′ 30″), the latitude obtained from it (75° 33′ north) was in very good agreement with the ship's position by dead reckoning. The observer's personal log for that morning reads "Soon after midnight we began to encounter open field ice, and by 6 a m were working in towards the northeast shore of Melville Bay through fields of pan ice and small bergs that often sent Mate McCue to the foremast head The whole aspect of the land in sight in the distance was one to make the viewer automatically reach for an extra sweater"

On August 8 the *Bowdoin* anchored in the fiord at Etah Magnetic observations were made at the C. I. W station established by C C Craft in 1908 After a few days of hunting around for a suitable harbor in which to winter, the *Bowdoin* dropped anchor in Refuge Harbor August 17, 1923, and the Expedition began to prepare for the long winter, the beginning of which was already indicated Two families of Eskimos had joined the Expedition a few days before at the request of Dr MacMillan The men were to be our dog drivers and their wives were to help us in making our skin clothing for the winter These people busied themselves erecting an igloo (house), hunting walrus and seal, and helping the Expedition to land its winter's supply of food.

After making appropriate observations with dip circle 241 to determine the magnetic meridian, the observer started August 18 to stake out the temporary observatory and to excavate for the pier and building foundations On the evening of August 22, all the cement work had been completed and it was none too soon, for the following three days were cold, stormy ones with strong northeasterly winds and snow The concrete used for building foundations and instrument piers, and for tripod bases at the absolute station, was mixed in the following proportions One bag of cement, 3 bags of bank gravel, and 8 pounds of "Cal" (a trade preparation facilitating mixing and placing of concrete at temperatures below freezing), mixed with sea water heated to a temperature of 120° F Before further work was done, the vessel got under way and proceeded to Peteravik, about 50 miles to the southward, to get a load of walrus meat that our Eskimos had cached there The *Bowdoin* returned to winter-quarters August 28, dropping her anchor at $10^h 30^m$ p m Construction of the observatory was resumed on the following day Throughout the long job of building the temporary observatory under very unfavorable conditions, Mr. Mix, the wireless operator, worked with the observer, rendering every assistance possible. From time to time, when Mate McCue was not otherwise occupied with his duties on the *Bowdoin*, he also helped in the building of the observatory His efforts were particularly helpful when the concrete work was in progress and also when the roofing was being laid When the building was ready for the stone-and-bag walls, the greater part of the personnel of the expedition assisted, finishing that part of the building on September 15, 1923, in less than two and one-half days.

On the night of September 15 Deneb and Vega and a few more of the brighter stars were visible at Refuge Harbor From that time on, the darkness at midnight became more and more pronounced and the long arctic day was over With the coming of darkness, radio communication was again established Mr. Mix, the operator, had succeeded in raising Canadian and American amateurs on the passage northward until the *Bowdoin* reached the latitude of midnight Sun. Then all "south-bound" transmission had ceased until the middle of September, when the operator was able to resume two-way communication On Sunday evening, September 23, 1923, we were happy to find it was possible to tune in religious services from Omaha (Nebraska), Dallas (Texas), and Davenport (Iowa) There were times when practically every word could be understood, but these times, often very brief, were rare Generally about one word in ten was understood, so that the mind of the listener was unable to bridge the gaps between words In such cases not even the gist of the program was gained More often than not, it

was with difficulty that sufficient was understood to allow us to say without question to what station we were listening

On September 20 many stars were visible in the rapidly increasing darkness at night, first-magnitude stars, Polaris, and the stars forming the big dipper being easily recognized At this time the harbor began to skim over with ice Once formed, in a few hours of low temperature and no wind, this ice rapidly increased in strength and thickness On September 28 we were able to walk three-quarters of the way ashore from the vessel There were mild days, however, usually accompanied by a fall of large-flaked, soggy snow, which weakened and rotted the ice so as to make it treacherous for those who lacked extreme caution It was not until October 10 that the ice was solid enough to warrant running the lighting cable from the vessel to the observatory On October 19, 1923, the observatory went into operation and registered continuously for a period of eight months the declination, horizontal intensity, and vertical intensity of the Earth's magnetic field, and the electrical potential-gradient of the atmosphere

During the eight months that the observatory was in operation, 26 sets of absolute magnetic observations and five sets of absolute potential-gradient observations were taken Latitude, longitude, and azimuth observations were taken at the absolute station with theodolite 2 in the autumn before the Sun left us and again in the summer when the Sun had returned The final revised location of the absolute station is as follows Latitude, 78° 32′5 north, longitude, 72° 22′8 west Magnetic observations were made at the absolute station approximately three times each month during the dark period and once each week during the spring and early summer, using Dover dip circle 241 for all observations with the exception of those made immediately before and after the spring sledge-trip to Cape Sabine On this trip a magnetic station was established at Camp Clay, the 1884 winter-quarters of the ill-fated Lady Franklin Bay Expedition, under command of General A. W Greely, then lieutenant in the United States Army. Dover dip circle 242 was used at Camp Clay, it was compared indirectly, both before and after the trip, with standard dip-circle 241, the results with the two circles being referred to the same time by the magnetograms.

The observatory, as previously designed by Mr Goddard, was constructed in accordance with the specifications and blue-prints supplied by the Department The observer found that on the whole the building quite successfully answered the purpose for which it was intended and at very small expenditure Considering the number of difficulties that might have arisen to embarrass the observer, really very little in the way of serious trouble was encountered in the operation of the observatory This was largely due to the very complete equipment which the Department sent for the Expedition's use For example, two driving-clocks were sent for each recorder The original clock of the potential-gradient recorder, although it would run without a load, was found insufficient to drive the recording drum, this caused no embarrassment, as there was a reserve driving-clock to fall back upon The observer feels that, in all cases where duplicate parts of apparatus can be sent with isolated expeditions, such as this one, without increasing the expense beyond reason, it should be done

The lamp-sockets provided for the 12- to 16-volt, 4-candlepower lamps of the magnetograph were not found satisfactory and should be replaced by sockets of more sturdy construction

Some trouble was experienced in connection with frost crystals collecting within the conducting tube of the potential-gradient wall-insulator On February 15 it was found necessary to remove the wall-insulator and take it to the *Bowdoin* for inspection Excessive leaks had been experienced for several days, but weather conditions had hindered the removal and inspection of the insulator Upon taking off one side of the conducting tube there was found a huge ball of frost crystals, filling the tube about a foot from the

inside end of the insulator These crystals established a contact between the conducting wire and the walls of the tube, thus grounding the electrometer system It appeared that as the relatively warm air from the observatory, containing more or less moisture due to the combustion of the heating-lamps and the observer's breath while in the passageway between the walls of the building, worked out towards the cold outside air, it was gradually chilled until it reached a temperature at which it was saturated At this point the moisture sublimated, and as a result finally grounded the electrometer system The tube was cleaned and dried out, the rubber surfaces were polished, and the suphur surfaces were smoothed up a bit A jacket of "balsam wool" was lashed about the tube, and the insulator was once more put in place Leak-tests showed a leak of 8 per cent at the end of five minutes, using a charge of +300 volts. It was found necessary to repeat this cleaning process in April, but on the whole the insulation system worked quite efficiently under the existing conditions. In the second week of November a pink plant-growth was discovered on the emulsion side of some of the traces which were in the drying-rack over the observer's bunk in the forecastle The same sort of thing was found growing on the damp under sides of some of the mattresses in the forecastle bunks Just what is the nature of the growth no one in the party could say, but it would doubtless be of interest to students of that form of plant life.

Time-breaks were recorded once per month An interval of two hours and a break of five minutes were used, in a few cases it was found more expedient to use a four-hour interval A knife-switch located in the *Bowdoin's* hold made it possible to open and close the observatory circuit without leaving the vessel This feature, simple in itself, materially lessened the work of recording time-breaks over a 24-hour interval during the dark season

The two electric leads to the observatory were 500 feet long and of rubber-insulated copper wire, with 3/64-inch insulation The electric lamps installed were two 12- to 16-volt, 4-candlepower lamps in the building and one telltale, 12- to 16-volt, 4-candlepower lamp in the *Bowdoin's* hold, all three lamps in series on the 32-volt line On December 26 another lamp was added to the circuit, making four 12- to 16-volt lamps in series on the 32-volt line This last lamp was added because the sending apparatus of the *Bowdoin's* radio appeared to induce an additional voltage on the observatory lighting-line whenever the transmitting key was closed When the ship's station, *WNP*, was transmitting, the lamps in the observatory circuit pulsated from normal brilliancy to a much increased brilliancy The radio battery and the battery from which the observatory line drew its power were entirely separate and distinct, so that quite probably the effect was due to induction from the antenna

During the winter the actual observing-time for a complete set of dip-circle observations, including two declinations, inclination with two needles, and total-intensity observations (loaded dip and deflections), has been as great as five hours This was due to the darkness, poor lighting facilities, cold and frosted lenses, and, more often than not, to a thoroughly chilled observer. The difficulties of observing were much less than in Baffin Land, when the observer used similar equipment *not* provided with celluloid covers for tangent screws, clamping screws, eye-pieces, etc The advantages of these celluloid caps can not be over-emphasized for polar work when observations must be made at very low temperatures In the spring a complete set of observations was easily possible in three hours and a quarter With the return of the Sun on February 20, after an absence of about 120 days, out-of-door activity on the part of the members of the expedition increased by leaps and bounds In one month the length of day and night was equal, a truly rapid transition, but not any greater than was to take place in the following month, for on April 20 the Sun came above the horizon not to disappear below it until August 23 at Refuge Harbor. A change from no direct Sun's rays to 24 hours per day of

direct sunlight in two months' time is a sufficiently abrupt change to disarrange the schedule of the most phlegmatic individual

It was not until May 2 that the first series of absolute potential-gradient observations was obtained The site selected for these observations was on the ice at about the center of Refuge Harbor In order to relieve the silver-chloride batteries from calibration duty in the observatory, so as to have them always ready for use in taking observations with bifilar electrometer 20, three 90-volt units of "B" batteries were made up for calibration duty Four 22 5-volt "B" batteries wired in series to form one "90-volt unit" would generally show a closed circuit voltage very close to the rated amount, the three made at winter-quarters for observatory use showed 89, 88, and 92 volts, respectively, when tested with Weston voltmeter 32702 at a temperature approximately +13°C

It is thought that when the winter potential-gradient records are studied in conjunction with the wind and weather records a direct correlation will be found to exist between the abnormally high values of potential-gradient and fresh wind (generally northeast at Refuge Harbor) laden with fine snow (practically frost crystals) and drift, blowing past the collector

In the early summer of 1924 the observer undertook a plane-table survey of Refuge Harbor and the adjacent coast-line The work of erecting rock cairns on the prominent hilltops and at other commanding locations was begun as soon as weather conditions would permit in the spring Our Eskimo women were very happy to make the necessary station-flags of red and white cotton cloth When they were finished, we had half red and half white vertically striped flags, half white and half red horizontally striped flags, white flags with red centers, and red flags with white centers These flags were tacked on poles and stuck up in the snow at salient points along the shore-line to act as dummy rodmen, the survey being almost entirely a one-man undertaking When the points at which the flags had been placed had been located on the plane-table sheet, the flags were moved to new locations, and so the survey progressed The plane table was somewhat of a makeshift, but answered the purpose fairly well An ordinary light camera tripod with a flat board approximately 12 by 16 inches mounted upon it made the instrument, which was leveled by means of a pair of levels The alidade consisted of a 1-inch square ruling stick with a sight-vane mounted on each end The engineer, Mr Jaynes, very kindly made the sight-vanes from a piece of aluminum which he salvaged from an old pulley found at Etah near the site of the quarters of the Crocker Land Expedition The resulting map covers an area of about 3 square miles and contains about 6 miles of shore-line (see Fig 2 with description of station at Refuge Harbor)

On June 20 the magnetic and electric observatory was discontinued, and the task of repacking the instruments and equipment was begun By June 25 the work was so nearly completed that the observer felt free to go to Littleton Island with Engineer Jaynes, Operator Mix, and two families of Eskimos on an eider-duck and egg hunt The Expedition's food supplies were reaching a low ebb at this time, so that additions to the larder were much needed.

The remaining time to August, when we started southward, flew by rapidly There were extra Sun-observations to be obtained, records to be put in a little more finished state, a few loose ends of the plane-table survey to be picked up, and a few odd pieces of equipment to be packed or crated.

And then with the thoughts that soon we would be homeward bound came the realization that we would be saying good-bye to our Eskimo companions, perhaps forever For about a year we had been in intimate contact with these people, with whom we could converse but little, owing to the fact that neither race thoroughly understood the tongue of the other, and between us there had grown up a companionship which did not require a great deal of verbal exchange of ideas in order that it might thrive. We had come to

look upon the Eskimos as our friends and, I believe, they looked upon us as their friends The friendships that had been formed were of a rugged, hardy type, they had been tested by the rigors of a dark arctic winter, and they were of firmer woof and warp because of that It was with a great deal of reluctance, therefore, that we exchanged the last silent handshakes with our friends of the north

The passage southward was more or less uneventful, according to the imagination of the particular individual Refuge Harbor was left behind August 1, 1924 On the homeward voyage opportunity was afforded to make magnetic observations at the following places Keate, Akpani, Godhavn, Holstensborg, and Godthaab in Greenland, and a partial set of observations at Hopedale, Labrador The *Bowdoin* arrived at Wiscasset, Maine, September 20, 1924

Table 27 gives names of field stations where magnetic and astronomic observations were made by the Expedition, with dates of occupation and geographic positions

TABLE 27

No	Name	Date	Lat North	Long East
		1923	° ′	° ′
1	*Sydney*, Nova Scotia	June 30 – July 2	46 08 8	299 47 8
2	Red Bay, Labrador	July 7	51 43 8	303 33 8
3	*Battle Harbor, C*, Labrador	July 11–12	52 16 4	304 25
4	*Gready*, Labrador	July 15	53 48 2	303 30 9
5	*Hopedale, A*, Labrador	July 23	55 27 1	299 48
6	Godthaab, Greenland	July 29	64 11 6	308 17 3
7	*Etah*, North Greenland	Aug 10–11	78 19 5	287 18 2
		1924		
8	Camp Clay, Cape Sabine	May 7	78 45 5	285 44 4
9	Keate, North Greenland	Aug 5	77 20 5	288 29 3
10	Akpani, North Greenland	Aug 7, 9	76 06 0	291 42 2
11	*Godhavn*, Greenland	Aug 17–18	69 15 0	306 26 0
12	*Holstensborg*, Greenland	Aug 23–24	66 55 9	306 21 8
13	*Godthaab*, Greenland	Aug 29	64 11 6	308 17 3
14	*Hopedale, B*, Labrador	Sep 6	55 27 1	299 48

It is a pleasure to make record of the cordial cooperation and effective assistance received from Dr MacMillan and the members of his party (particularly Messrs Mix, McCue, and Jaynes) Without this enthusiastic support, the execution of the observer's instructions would have been much more difficult and certainly less complete

J W GREEN, ON MAGNETIC WORK IN THE BAHAMAS, WEST INDIES, VENEZUELA, GUIANAS, BRAZIL, ARGENTINA, BOLIVIA, AND PERU, JUNE 1922 TO SEPTEMBER 1923

The report on the work of this expedition is conveniently presented in four sections, as indicated in the following synopsis

(1) The Bahamas and Havana, Cuba, in which Observer W A Love assisted

(2) West Indies, including Haiti, Dominican Republic, Jamaica, and Curaçao, and northern Venezuela

(3) Trinidad, Barbados and St Vincent in the British West Indies, the Orinoco, and the northern coast of the three Guianas to Pará, Brazil In this work Observer J T Howard assisted

(4) Along the eastern coast of Brazil, across Argentina and Bolivia to the Huancayo Observatory in Peru

(1) THE BAHAMAS, JUNE TO AUGUST 1922

In accordance with instructions from the Director dated June 10, 1922, accompanied by Observer W A Love, I left Washington, D C, June 19 following My instrumental outfit consisted of magnetometer-inductor 25, pocket chronometer 50110, and three watches, together with observing-tent and complete outfit of accessories, Mr Love's

consisted of magnetometer-inductor 26, pocket chronometer, and three watches, observing-tent, and complete outfit of accessories

Leaving Washington by rail, we first reoccupied the United States Coast and Geodetic Survey stations at Waycross, Georgia, and Miami, Florida, and established auxiliary stations at both places, carrying out the class I program at Waycross From Miami we crossed to the Bahama Islands, arriving at Nassau on July 1 After observing at Nassau and at Hog Island near the 1903 station of the Baltimore Geographical Society, a short side trip was made to the island of Eleuthera on a large gasoline launch which made the trip every two weeks carrying mail Mr Love disembarked at Governor's Harbor, while I went on to Rock Sound, where the boat remained two days, giving ample time for observational work On the return, Mr Love rejoined us at Governor's Harbor, and we reached Nassau July 12 The same day permission was secured for Mr Love to join a party just starting on a four-day hunting expedition to Green Cay, about 65 miles south of Nassau Pending his return, I endeavored to make arrangements for a more extensive trip through the outer islands of the Bahama group Transportation on a mail schooner which made occasional trips was promised, but for some reason the sailing date was postponed a week or two, and arrangements were finally made to charter a small sailboat with auxiliary power In the meantime, Mr Love had returned from Green Cay and had then gone with a timber trader to Fresh Creek on Andros Island Upon his return from this latter place, preparations were completed for the outer island trip

The better class of power boats are not available except at prohibitive prices on account of the demand for such boats in the highly lucrative liquor trade The boat finally secured was a 35-foot sloop with gasoline auxiliary engine of 16 horsepower The crew consisted of a captain, an engineer, a cook, and a deck hand, all negroes. The accommodations were of the crudest The top of a gasoline barrel served as table upon which we ate our unappetizing meals, prepared under wretched conditions I spent all of the ten nights on the deck with the canvas of my observing-tent as bedding and cover, while Mr Love endured the discomforts of the cabin, which was also used by the crew Our agreement provided that we should pay for all the gasoline and engine oil required, furnish our own provisions, pay a lump sum of $40 for the subsistence of the men, and $20 per day for the use of the boat and crew

The course from Nassau, which we left on the morning of July 27, lay to the southeast against heavy head winds and rough seas, across the north end of Exuma Sound, to the southmost point of Eleuthera Island, where we anchored for the night On the following day we reached Bight Settlement on Cat Island, where arrangements for observations were made Two nights were spent at Port Nelson on Rum Cay in order to permit a series of diurnal-variation observations in declination On account of the approach of rougher weather and the hurricane season, it was considered inadvisable to cross over to Watling's Island (San Salvador), but the passage to Crooked Island was made and the night of August 1 spent at anchor there The following morning we pushed on to Albert Town on Fortune Island, where the most southerly station in the Bahamas on this trip was established on August 2 On the return northward we made stations at Galloway on Long Island, at George Town on Great Exuma, and at Farmer's Cay, arriving at Nassau late on August 6 A more extended survey was prevented by lack of a suitable means of reaching more distant places, and by the limit of endurance of the observers, which was severely tested by this ten-day trip, both having suffered serious attacks of dengue or "breakbone fever" during the journey, and both being worn out by the physical hardships imposed by the life on the boat, the poor food, and the loss of sleep occasioned by roughness of the water in which they were compelled to anchor on the majority of the nights We had sailed more than 450 nautical miles, and had made observations at six different places in the ten days

Not being able to go directly from Nassau to Havana, we returned to Miami, Florida, going thence to Havana, where two repeat stations were reoccupied, at one of which the class I program of observations was followed

Throughout the work in the Bahamas the most cordial assistance was rendered by the officials of the colony, and the observers acknowledge their obligation to the resident commissioners at the outlying points for indispensable assistance

Table 28 shows the magnetic stations occupied by both observers, their geographic positions, and the dates of occupation; for further details, see Descriptions of Stations and Table of Results.

TABLE 28

No	Name	Date	Lat North	Long East
	United States	*1922*	° ′	° ′
1	*Waycross, A*	June 21–22	31 14 1	277 39
2	*Waycross, B* [a]	June 21–22	31 14 1	279 39
3	*Miami, A*	June 26–27	25 46 3	279 49
4	*Miami, B* [a]	June 26	25 46 3	279 49
	Bahamas			
5	Nassau, *C* [a]	July 3	25 05 5	282 39
6	Nassau, *A*	July 4, 6	25 04 5	282 39
7	Nassau, *B*	July 5,15	25 04 5	282 38
8	Governor's Harbor [a]	July 8	25 12 3	283 45
9	Rock Sound	July 10	24 51 8	283 50
10	Green Cay [a]	July 13	24 02 0	282 50
11	Fresh Creek [a]	July 19	24 43 7	282 13
12	Bight Settlement	July 29	24 18 5	284 33
13	Port Nelson	July 31	23 38 7	285 09
14	Port Nelson, [a] *Secondary*	July 31	23 38 7	285 09
15	Albert Town [a]	Aug 2	22 36 6	285 39
16	Galloway	Aug 3	23 02 7	285 02
17	George Town [a]	Aug 4	23 30 8	284 14
18	Farmer's Cay	Aug 5	23 57 5	283 42
	Cuba			
19	*Havana, Casa Blanca,* [a] *A*	Aug 16–17	23 09 4	277 39
20	*Havana, Villa*	Aug 16	23 06 4	277 39
21	Havana, *Casa Blanca, Secondary*	Aug 17	23 09 4	277 39

[a] Magnetic observations made by Observer W A Love

(2) HAITI, CURAÇAO, AND VENEZUELA, SEPTEMBER TO DECEMBER 1922

After completing the work at Havana, Cuba, I turned over to Mr. Love the outfit assigned to him, and left him to complete the remaining work in Cuba according to instructions he had already received from the Office I then went by rail to Santiago de Cuba, hoping to find transportation direct to Port au Prince, Haiti In this I was disappointed, as the monthly boat for that port had sailed two days before my arrival As no schooner or chance vessel was available without long delay, I obtained passage on a steamer bound for Kingston, Jamaica, in the expectation of meeting a vessel advertised to sail direct from Kingston to Port au Prince about September 1 After waiting until September 8 for this vessel, information was given out that for lack of sufficient cargo the sailing to Port au Prince was canceled However, another vessel sailing direct was announced for September 12, and with this definite information I was able to use the intervening time in making regular and diurnal-variation observations at the old station, which would be occupied later by Mr. Love.

I arrived at Port au Prince, Haiti, on September 16, and after a day spent in attending to formalities required for entering the outfit and securing police registration, I established two stations On September 22 I went to Aux Cayes, a point easily reached by regular vessels Having been advised by officers of the United States marines stationed at Port au Prince that it was impracticable to reach the desired inland station at Las

Caobas at that season, but that an inland trip from Gonaives was feasible, I went by boat to the latter point, where observations were made on October 2 Hiring a Ford car, I set out for Hinche, 75 miles distant, but on account of the heavy rains and the condition of the roads and the streams to be forded, I was only able to go about 40 miles, to a ranch about 4 miles beyond St Michel, called L'Attalye, and there the observations were made In order to avoid a wait of about 10 days at Gonaives for a boat to take me around to Cap Haitien, I again hired a Ford car for the trip overland, whence, again by the same form of transportation, I went to Santiago, Dominican Republic, a distance of 150 miles, arriving October 11 Leaving Santiago, I easily reached Puerto Plata, La Vega, and Sanchez by rail, then by good fortune I found a boat that took me to La Romana, and the following day the sugar company's boat took me to Santo Domingo, arriving on the evening of October 27 The trip to Azua, 145 kilometers distant, and return was made by automobile, as waiting for regular sailing for that port would involve a long delay

TABLE 29

No	Name	Date	Lat North	Long East
	Jamaica	*1922*	° ′	° ′
1	*Kingston, 1905*	Sep 4	17 58 9	283 11
	Haiti			
2	Port au Prince, *A*	Sep 18–19	18 34 2	287 41
3	Port au Prince, *B*	Sep 20	18 34 2	287 41
4	Aux Cayes	Sep 25	18 11 3	286 17
5	Gonaives	Oct 2– 3	19 25 8	287 18
6	L'Atallye	Oct 5	19 21 7	287 43
7	Cap Haitien	Oct 9–10	19 46 4	287 48
	Dominican Republic			
8	Puerto Plata	Oct 14–15	19 49 0	289 18
9	La Vega	Oct 19	19 14 7	289 28
10	Sanchez	Oct 21	19 14 3	290 23
11	La Romana	Oct 26	18 24 1	291 03
12	Santo Domingo, *A*	Oct 30–31, Nov 1	18 27 8	290 06
13	Santo Domingo, *B*	Oct 31	18 27 8	290 06
14	Azua	Nov 3– 4	18 27 7	289 16
	Curaçao			
15	*Willemstad, 1913*	Nov 13	12 06 5	291 05
16	Willemstad, *A*	Nov 14–16	12 07 0	291 04
17	Willemstad, *B*	Nov 16	12 06 9	291 04
	Venezuela			
18	Isla Pajaro	Nov 22	10 35 9	288 29
19	*Maracaibo*	Nov 23–25	10 40 4	288 25
20	*La Ceiba*	Nov 25–26	9 28 3	288 57
21	*Puerto Cabello*	Dec 14–15	10 28 7	291 59
22	*Barquisimeto*	Dec 19–20	10 04 8	290 42
23	*Caracas, A*	Dec 24–26	10 30 4	293 04
24	Caracas, *B*	Dec 27	10 30 4	293 04
		1923		
25	*Barcelona, A*	Jan 7	10 08 5	295 18
26	Barcelona, *B*	Jan 7	10 08 6	295 18
27	*Carupano*	Jan 12–13	10 39 9	296 45

The monthly sailing for Curaçao from Santo Domingo had been discontinued, and as no other vessel sailing direct was available, I found it necessary to go to San Juan, Porto Rico, which I was able to do in time to make a good connection with a regular line steamer for Curaçao, arriving at the latter place on November 12 Three stations were occupied in the immediate vicinity of Willemstad, but it was found impracticable to attempt observations on other islands of the group Direct transportation was secured to Maracaibo, Venezuela, where observations were made on November 23 and 24, after two days' delay in completing arrangements with officials for the requisite permission

Through the kindness of the officials of the Venezuela Sun Oil Company, I was enabled to reach La Ceiba, near the upper end of Lake Maracaibo, on one of their launches, secure observations there, and return to Maracaibo on the weekly mail steamer the following day. This accommodation was highly appreciated, as La Ceiba is situated on low, marshy ground, and is infested with malarial mosquitoes

A short delay was experienced in reaching Puerto Cabello from Maracaibo, going by way of Willemstad, Curaçao, and a further delay was occasioned by the refusal of the civil authorities at Puerto Cabello to permit my taking any observations without an official government permit. It was therefore necessary for me to go to Caracas and secure permission from the Minister of the Interior before doing the observational work at Puerto Cabello Although observations at La Ceiba were completed on November 26, because of this delay it was December 14 before work was begun at Puerto Cabello. The remaining stations in Venezuela, including Caracas, which was made a class I station, were occupied with but the ordinary delays of coastwise travel in that country, and Port of Spain, Trinidad, was reached January 15, 1923

The work in Haiti and the Dominican Republic was greatly facilitated by the courtesies and assistance rendered by the United States marines stationed on the island, and especial acknowledgment is made of the personal interest taken by the United States Minister at Caracas in securing official permission to make observations in Venezuela

Table 29 shows the stations at which magnetic observations were made, with dates of occupation and geographic positions, for additional details see Descriptions of Stations and Table of Results

(3) TRINIDAD TO PARA, JANUARY TO APRIL 1923

At Port of Spain, Trinidad, I was joined by Observer J T. Howard, who was to work with me while acquiring experience in field work before taking up independent work on the Amazon and tributaries In addition to the reoccupation of C I W stations at Port of Spain and San Fernando for secular variation, distribution stations desired by the Crown Survey Department were occupied at Toco, near the northeast corner of the island, Rio Claro, in the central part, and Cedros, in the southwestern part Mr J W Macgillivray, crown surveyor, afforded us every facility for carrying out this work at times most convenient for us, and the expenses of local travel between these stations and Port of Spain were defrayed by his office.

From Port of Spain a side trip was made, and C I W stations at Bridgetown, Barbados, and Kingstown, St Vincent, were reoccupied for secular variation.

Supplementary instructions of December 23, 1922, provided for a few additional stations in Venezuela, along the Orinoco River Accordingly we left Port of Spain February 10 and reached Ciudad Bolivar February 13, after having been delayed about 30 hours en route by the vessel getting stuck on a sand-bar

From Ciudad Bolivar the intention was to proceed to San Fernando de Apure and La Urbana, and possibly as far as San Fernando de Atabapo, but circumstances prevented any further ascent of the Orinoco It was the season of low water Above Ciudad Bolivar it was possible to navigate only vessels of very shallow draft There were but two such vessels in commission at that time, both very small Furthermore, some malcontents in the vicinity of La Urbana and San Fernando de Apure had taken advantage of the difficulty in transporting government troops, due to the low water, and had started a small revolt The two small vessels had been commandeered by the Government for transportation of troops, and the only other available means of transportation was a chartered sailboat The time necessary to make the river trip by such means was so excessive that the project was abandoned, and we returned to Port of Spain.

From Port of Spain we then proceeded along the coast of British Guiana, Dutch Guiana, and French Guiana, thence to Para, Brazil, which point was reached April 16 Six of the stations of 1908 were reoccupied en route, one of which, Paramaribo, was made a class I station, and the diurnal-variation observations in declination and horizontal intensity were made at a new station at St Laurent, during an enforced delay waiting for an opportunity to reach Cayenne

Transportation facilities are meager and unsatisfactory through the regions just mentioned, and we were particularly fortunate in securing passage on a small tramp cattle steamer from Cayenne to Para From the experiences of this trip, it appears that stations along the north coast of South America are more readily reached by going by way of the West Indies direct to Cayenne, working westward from there Vessels of the Royal West Indian Netherlands Line frequently touch at ports along this coast-line, westbound, and upon reaching Barranquilla or Puerto Colombia, proceed directly to Europe without touching at north coast ports on the homeward journey Communication between Cayenne and Para is very infrequent, being confined to chance trading-vessels. Indeed, Para is not easily reached either from Guiana or the West Indies

The secular-variation station at Pinheiro, near Belem, Para, was jointly occupied as a class I station, and while Mr Howard began preparations for his independent Amazon work, I reoccupied the 1915 station at Alcobaça on the Tocantins River Returning to Belem, I left Mr Howard in charge of the work outlined for him and proceeded southward on April 25

Table 30 shows the stations at which magnetic observations were made, with dates of occupation and geographic positions; for additional details see Descriptions of Stations and Table of Results

TABLE 30

No	Name [a]	Date	Latitude	Long East
		1923	° ′	° ′
1	*Port of Spain (1905)*	Jan 16	10 40 0 N	298 28
2	Port of Spain, *A*	Jan 16–18	10 40 0 N	298 29
3	*San Fernando, A*	Jan 19	10 16 8 N	298 33
4	Toco	Jan 22	10 50 1 N	299 04
5	*Bridgetown, A*	Jan 25–26	13 04 8 N	300 25
6	*Kingstown*	Jan 29	13 09 2 N	298 46
7	*Ciudad Bolivar*	Feb 14–20	8 09 1 N	296 28
8	*Georgetown, B*	Mar 7	6 48 0 N	301 51
9	*New Amsterdam*	Mar 9	6 16 3 N	302 29
10	*Paramaribo*	Mar 17, 19–20	5 50 0 N	304 51
11	St Laurent, *A*	Mar 30–31	5 29 4 N	305 59
12	*Cayenne, A*	Apr 9–10	4 56 1 N	307 40
13	*Pinheiro, A* and *B*	Apr 18–19	1 17 9 S	311 31
14	*Alcobaça*	Apr 22–23	3 45 2 S	310 19

[a] The stations are located in the following countries Nos 1 to 6, West Indies, No 7, Venezuela, Nos 8 to 12, Guianas, Nos 13 and 14, Brazil

(4) PARA TO HUANCAYO OBSERVATORY, PERU, APRIL TO SEPTEMBER 1923

My work in eastern Brazil was to consist mainly of the occupation of certain stations at which observations had been made by the Brazilian Commission in 1903 and 1904, and to secure a comparison of my instruments with those in use at the Vassouras Observatory

Leaving Belem, Para, on April 28, traveling by coastwise vessel, I reached San Luis May 2, but on account of a malignant yellow-fever epidemic I was obliged to omit Fortaleza, which was designated as a class I station Proceeding by the same class of vessels, I reached Pernambuco and Bahia, occupying both primary and auxiliary stations

at both ports, the latter being a class I station. Joazeiro, a station of the Commission, on the Rio de San Francisco, was reached by railway from Bahia, a distance of about 440 kilometers. On the return connection was made with a train for Aracaju on the coast, where the station of the Commission was also occupied. After a trip by boat to Caravellas, I found it necessary to return to Bahia in order to get passage to Victoria. Victoria was discovered to be in a region of great local magnetic disturbance. An electric-car line has been built near the station of the Commission and it could not be reoccupied, but three other well-separated stations were established from which a mean value may quite probably be taken to represent the normal distribution for the region. I left Victoria June 25 and arrived at Rio de Janeiro the following day.

At Rio de Janeiro I received cabled instructions to omit the greater part of the work outlined for central and southern Brazil and proceed to Buenos Aires, because of the necessity of an earlier return to Washington than was originally intended. After having compared my instrument with those of the Vassouras Observatory, I established a station at Santos. I then returned to Rio de Janeiro in order to reach Buenos Aires by an earlier vessel, and arrived at the latter port July 21. At Buenos Aires I received supplementary instructions dated June 6, 1923.

Leaving Buenos Aires July 26, I encountered little or no delay in transportation, and reached Mollendo, Peru, on the Pacific side, August 27, having secured observations at seven repeat stations en route, including comparison observations at magnetic observatories of the Argentina Meteorological Service at Pilar and La Quiaca. Two stations were reoccupied in Bolivia, and two in southern Peru. At Mollendo I was able to transfer directly from the train to a vessel of the Grace Line, and two days later, August 29, I arrived at Callao and Lima.

The Huancayo Observatory was reached September 1, instrumental comparisons made during the ensuing four days, following which a series of simultaneous observations for station difference between the standard observatory piers in the new absolute building and the station designated as "Frame" were made.

I left Huancayo Observatory September 7, arrived at Lima September 8, sailed from Callao September 12, and reached New York September 24. Proceeding at once to Washington, I reported at the Office September 25.

In all, 61 stations were occupied, not counting a few that were occupied jointly with Mr. Love and Mr. Howard, and the cahiers forwarded under their names. Of these 61 stations, there were 8 class I stations, 21 class II stations, 12 class III stations, 16 class IV stations, and 4 were comparisons at observatories. Also there were forwarded from these 61 stations 89 cahiers of results.

The total distance covered from the time of leaving Washington until returning thereto was 23,811 miles, exclusive of local travel to and from magnetic stations, of which 4,107 miles was travel to and from the field. Of the total distance traveled, 14,889 miles were by steamer, 7,274 miles by railways, 868 miles by automobile, 690 miles by sailboat, and 90 miles by small launch. The average distance covered per station, including travel to and from the field, was 390 miles. Excluding travel to and from the field, the average distance per station was 323 miles.

The total cost of the entire trip was $4,760.83, an average of $78.05 per station, or excluding the cost of travel to and from the field, the average cost per station was $71.41.

It is a pleasure to acknowledge the cordial reception and courteous treatment accorded me at each of the United States consulates visited during the course of the work. My work in Brazil and Argentina was greatly facilitated by the cordial cooperation of Dr. Henrique Morize, director of the National Observatory of Brazil, and of Mr. G. O. Wiggin, chief of the Meteorological Office at Buenos Aires.

Table 31 shows the stations at which magnetic observations were made, with dates of occupation and geographic positions, for additional details, see Descriptions of Stations and Table of Results

TABLE 31

No	Name [a]	Date	Lat South	Long East
		1923	° ′	° ′
1	San Luis (Campo do Durique)	May 2	2 31 4	315 43
2	San Luis, *A*	May 3–4	2 30 3	315 43
3	San Luis, *B*	May 3	2 30 3	315 43
4	Pernambuco, *B*	May 11	8 03 6	325 07
5	*Pernambuco, A*	May 12	8 03 7	325 06
6	Bahia, *A*	May 18–20	13 00 5	321 29
7	Bahia, *B*	May 21	13 00 5	321 29
8	Joazeiro, *A*	May 25–26	9 24 1	319 29
9	Joazeiro, *B*	May 26	9 24 1	319 29
10	Aracaju	May 31– June 1	10 5 40	322 55
11	Caravellas, *A*	June 11–12	17 44 4	320 47
12	Caravellas, *B*	June 12	17 44 2	320 47
13	Victoria, *B*	June 21	20 20 0	319 40
14	Victoria, *C*	June 21–22	20 20 1	319 40
15	Victoria, *A*	June 22–23	20 19 9	319 40
16	*Vassouras, A, B, and C*	June 30– July 2	22 24 0	316 21
17	Santos, *B*	July 9	23 57 5	313 36
18	Santos, *A*	July 9–10	23 57 5	313 36
19	*Florida, B*	July 24	34 32 1	301 29
20	*Pilar, Pier B*	July 27–29	31 40 1	296 07
21	*Pilar, Pier 5*	July 29–31	31 40 1	296 07
22	*Tucumán*	Aug 1	26 51 1	294 46
23	La Quiaca, *B*	Aug 3–4	22 06 6	294 25
24	*La Quiaca, Magnetometer Pier*	Aug 4–6	22 06 6	294 25
25	*La Quiaca, Station 1917*	Aug 5	22 06 6	294 25
26	*Uyuni, A*	Aug 9–10	20 28 0	293 11
27	Uyuni, *B*	Aug 10	20 28 0	293 11
28	*La Paz, 1917*	Aug 13–14	16 31 0	291 47
29	La Paz, *B*	Aug 14	16 31 1	291 47
30	*Juliaca, A*	Aug 20–21	15 30 0	289 51
31	Juliaca, *B*	Aug 20	15 30 0	289 51
32	*Arequipa, A*	Aug 23–25	16 22 5	288 27
33	Arequipa, *B*	Aug 25	16 22 5	288 27
34	*Huancayo Observatory, W_m*	Sep 2–5	12 02 7	284 40
35	Huancayo Observatory, E_m	Sep 3–4	12 02 7	284 40
36	Huancayo Observatory, *Frame*	Sep 5–6	12 02 7	284 40

[a] The stations are located in the following countries Nos 1 to 18 are in Brazil, Nos 19 to 25 are in Argentina, Nos 26 to 29 are in Bolivia, and Nos 30 to 36 are in Peru.

J W GREEN, ON MAGNETIC WORK IN MEXICO, JUNE TO AUGUST 1924

In accordance with instructions from the Director dated June 7, 1924, I left Washington, accompanied by Observer John Lindsay, on the evening of June 8, for magnetic work in Mexico

We were instructed to proceed directly to Mexico City, stopping en route for observations only at Sabinas and Monterrey in northern Mexico We crossed the international boundary at Eagle Pass, arriving at Piedras Negras on June 12 There we found the way had been cleared for us through the kindness of Professor Joaquin Gallo, director of the Observatorio Astronomico Nacional in Mexico City, who had advised the customs officials of our coming Our instrumental outfits and personal baggage were passed through the custom-house with only formal inspection and no delay whatever

Sabinas was occupied as a class III station and Monterrey as a class I station Going thence directly to Mexico City, we were met on Sunday morning, June 22, by Professor Gallo, director, and Mr. R O. Sandoval, magnetic observer, of the National Observatory

Professor Gallo accompanied us to a hotel, and then after breakfast as his guests we had the very enjoyable experience of visiting the parks and interesting places in the city with him as our guide

The following day Professor Gallo secured for us an audience with the Secretario de Agricultura y Fomento After explaining the nature of our work to this official, we were each given a letter calling upon all civil and military authorities in Mexico to give us every facility and assistance in the work we proposed doing in that country. This letter proved to be a very great aid in securing permission from local authorities everywhere we went

Tuesday, June 24, on Professor Gallo's invitation, we visited the magnetic observatory at Teoloyucan, which is 36 kilometers by rail north of Mexico City A very profitable day was spent in looking through the observatory, made particularly enjoyable by the excellent picnic dinner arranged by Professor Gallo, at which several distinctly Mexican dishes new to us were served

The following day, June 25, I went with Mr Lindsay to Puebla, 210 kilometers south of Mexico City After assisting him in locating a station site and in starting the program of observations, I returned to Mexico City Mr. Sandoval and I then took up the intercomparison observations between the observatory instruments, consisting of a Dover magnetometer and a Fauth dip circle, and C I. W magnetometer-inductor 26, the instrument I was using for field work. Several days were spent making these comparisons and carrying out the computations

In view of the fact that Professor Gallo has ordered from the Precise Instrument Company of Brooklyn a magnetometer-inductor of the type in use in our own field work, another day was spent in explaining in detail the construction and working principles of the instrument, and in having Mr Sandoval make some practice observations with it Testing their inductor and the practice observations by Mr. Sandoval were carried on at the Observatorio Nacional in Tacubaya During my stay of between two and three weeks in Mexico City, Professor Gallo gave me every possible assistance and did everything possible to make my stay in the city pleasant and enjoyable

By July 11, the work of comparison at Mexico City had been finished, Mr Lindsay had returned from the south after completing work at Puebla, and reoccupying the C I W station at Oaxaca, having completed the necessary computations, we traveled together to Queretaro and jointly occupied a class II station at that place

As Mr Lindsay had now become sufficiently familiar with the work to be able to continue alone, we separated at Queretaro Mr Lindsay went to San Luis Potosi, Tampico, Vera Cruz, and thence along the Gulf coast to Yucatan, occupying several additional stations en route, while I proceeded westward, stopping first at Guadalajara. From Guadalajara to the west coast, a choice of one of two routes was proposed. The first was to go by rail to Colima and then on to Manzanillo, in case the boat schedules would permit, and from Manzanillo proceed by steamer to Mazatlan However, while in Guadalajara, I learned from the steamship agencies that a vessel was leaving Manzanillo on the day I finished observing at Guadalajara and the next vessel for Mazatlan would be two weeks later. I, therefore, chose the alternate route, which was to go overland from Guadalajara to Tepic, substitute Tepic for Colima, and proceed to Mazatlan by rail

The trip overland was made in three stages. Leaving Guadalajara early in the morning of July 22 and traveling by motor stage, I reached La Quemada, 120 kilometers distant, about the middle of the afternoon. Arrangements were made with a mule driver for saddle and pack animals to start at daylight the next morning for Ixtlan del Rio, 70 kilometers distant.

My traveling companions were three Italians and much bargaining was necessary between these Italians and the mule driver in order to reach an agreement as to the charge for each animal Long before daylight the next morning we were up, had roused the Chinese proprietor of the "hotel and restaurant," and had eaten some breakfast Evidently the mules refused to be caught Six o'clock came and went At 7^h I was getting anxious, at 8^h I gave them up, and at 9^h I was trying to feel resigned to spending another day with the Chinese host when suddenly, about 9^h30^m, the driver with the mules put in an appearance After some further negotiations, about 10^h30^m, we finally got started. Being the rainy season, the trails were bad, the mules were slow and seemed utterly indifferent as to whether they reached their destination that day or the next week We stopped at another Chinese inn by the wayside for lunch, then plodded on About 5 p m. I began to suspect that we would not reach Ixtlan del Rio that night Upon putting the question to the driver my fears were confirmed, as he answered indifferently, "mañana " However, we had covered the worst part of the trail, had crossed the "Barranca," a deep gorge into which we descended, and made our way up and out again on the same side after traversing it for several miles Toward evening we arrived at the village called La Barranca, where we were to spend the night Unfortunately for us, a half hour earlier, a mule train going in the opposite direction had arrived, and the rooms were all taken at the so-called hotel Two of my companions found a room in a house across the street from the hotel, the third, having a blanket roll, proposed to sleep on the hotel porch, while I started down the street inquiring at every likely looking house for a night's lodging The owner of a small shop accommodated me and by paying one peso in advance, I secured a very good room with a bed equipped with a mosquito net.

We were up at 4 o'clock the next morning, and after a meager breakfast started in the gray light of early dawn in a drizzling rain, which, however, did not last long, and at 9 a. m we reached Ixtlan del Rio without further incident I was terribly stiff and lame, being unaccustomed to the saddle The change from the mule to a seat in the stage, a Ford truck equipped with seats having some homemade, excelsior stuffed cushions, seemed a welcome one indeed, for the truck seemed luxurious compared to the homemade saddle and the mule, but before we reached Tepic, 150 kilometers farther on, I would have been glad to get out of the truck and back on the mule

The road was merely a trail, but the driver was an optimist with lots of faith in that Ford truck He imagined the road was there, and all right, and drove accordingly We left Ixtlan del Rio on this 150-kilometer trip with a badly leaking radiator and not a single extra tire Rock-strewn stretches of trail, gullies, swamps, and mudholes were all alike treated with indifference by the driver of that truck That my instrument escaped damage is a miracle, but I had so packed it that it could not bounce, and with plenty of padding underneath, it came through safely Toward evening we passed an autotruck, fitted up as a stage, being ignominiously dragged out of a swamp by five yoke of oxen, while our car ploughed through under its own power and continued As darkness came on, our driver saw the lights of the other stage behind us and set out to arrive first in Tepic There seemed to be a loose connection in our lighting system and our lights were on part of the time and part of the time we drove in darkness But "faith will accomplish wonders", our driver had it and we arrived in Tepic at 8 p m , ahead of the other stage

From Tepic on there are continuous rail connections and I encountered no further difficulties of travel. Observations were made at Tepic, Mazatlan, Culican, and Guaymas, all on or near the west coast of Mexico After occupying Hermosillo, I proceeded directly to Tucson, Arizona, where I arrived Saturday, August 9, and was met by Mr A. K. Ludy, observer-in-charge of the United States Coast and Geodetic Survey magnetic observatory.

Intercomparison of my field instruments with those of the observatory was made here and also a series of observations with the magnetometer for diurnal variation in declination and horizontal intensity by deflections I then proceeded to El Paso, Texas, arriving August 14 Upon inquiry I found that I could reach Nueva Casas Grandes the next day and return late the following day, and this I did

Leaving El Paso early in the morning, I encountered little or no delay at the Mexican custom-house and Casas Grandes was reached at 4 p m There being no hotel at Casas Grandes, I walked back 2 miles to Colonia Dublan, an American colony of Latter Day Saints, where I found very satisfactory accommodations Observations were made the next day, August 16, and completed at 3 p m , the return train being expected at 3^h30^m It came at 6 p m , and we reached Ciudad Juarez at 2^h30^m a m , four hours late

The next afternoon I left Juarez again and arrived the same evening at Chihuahua, where observations during the next two days were made At Sweetwater, Texas, the U S Coast and Geodetic Survey station of 1910 was reoccupied August 22, and an auxiliary station was established about a mile to the westward This completed my list of stations and I returned to Washington, arriving early in the morning of August 30, having been absent from the Office 83 days

TABLE 32

No	Name	State	Date	Lat North	Long East
			1924	° ′	° ′
1	*Sabinas A, B* [a]	Coahuila	June 14	27 51 4	258 54
2	*Monterrey, A, B* [a]	Nueva Leon	June 17–19	25 40 5	259 40
3	Tecloyucan Obs'y, *B, Pier A, Pier B*	Mexico	June 27–July 1	19 44 8	260 49
4	Queretaro, *A, B* [a] *C, D*	Queretaro	July 12–13	20 35	259 35
5	Guadalajara,[a] *A, B*	Jalisco	July 18–19	20 44	256 37
6	Tepic	Nayarit	July 25–26	21 31 3	255 06
7	Mazatlan, *A, B*	Sinaloa	July 28–31	23 11	253 35
8	Culican	Sinaloa	Aug 2	24 47 5	252 36
9	*Guaymas, A, B*	Sonora	Aug 5–7	27 55	249 03[c]
10	*Hermosillo*	Sonora	Aug 8	29 04 4	249 03
11	Tucson Obs'y [b]	Arizona	Aug 11–13	32 14 8	249 10
12	*Nueva Casas Grandes*	Chihuahua	Aug 16	30 25 7	252 05
13	*Chihuahua, A, B, C*	Chihuahua	Aug 18–19	28 38	253 56
14	Sweetwater,[b] *A*	Texas	Aug 22–24	32 28 0	259 36
15	Sweetwater, *B*	Texas	Aug 25	32 28 0	259 35

[a] Observations at stations *B* at Sabinas, Monterrey, and Queretaro were made by Observer John Lindsay See his separate report [c] Longitude for Guaymas, *B*, is 249° 08′
[b] Nos 11, 14, and 15 are in United States, all other stations are in Mexico

Throughout my work in Mexico I was treated with the greatest kindness everywhere I was shown numerous courtesies and given every possible assistance by the Mexican officials In particular, I wish to mention Señor Francisco Salazar, captain of the port at Guaymas, and Señor Tomás Fregosa, C E , of the cadastral office, Guaymas These gentlemen assisted me in locating a site for a new station at Guaymas and also placed at my disposal a launch for going back and forth to the island in the bay on which is located the station of 1906

The total distance traveled on the entire trip was 8,378 miles, of which 7,999 miles were by rail, 339 miles by auto stage, and 40 miles by mule train

The total expense of the trip was $958 12, and 20 stations were occupied in 14 localities Of these stations, two were for intercomparison of instruments, and three were class I stations at which diurnal-variation observations were secured

Table 32 shows the stations occupied, with dates of occupation, and geographic positions, for additional details, see Descriptions of Stations and Table of Results

H R GRUMMANN, ON MAGNETIC WORK IN WEST INDIES, MARCH AND APRIL 1922

In accordance with instructions of the Director, the observer left New York on March 4, 1922, on the steamer *Fort St George* of the Quebec Steamship Company for St Thomas, for the purpose of reoccupying stations in the West Indies, at which the last previous observations had been made in 1905 The instrumental outfit consisted of magnetometer-inductor 26 with the usual accessories for field work

The station previously known as Charlotte Amalie, later called St Thomas, was reoccupied on March 10 and 11 Transportation between the islands is infrequent, especially to and from the smaller and less important ports, but fortunately a schooner provided passage from St Thomas to St Croix, where the 1905 station at Christiansted was reoccupied on March 18, and a new station established at Frederiksted March 22–23 A Clyde Line freighter furnished transportation to St Christopher (St Kitts), and after the observations at Basse Terre, the Quebec steamer *Guiana* was available for the passage to St Johns, Antigua Again taking passage on a freighter, the island of Guadeloupe was reached on April 11 Here the old station was found entirely unsuitable, and a new one was selected about 5 kilometers from Pointe à Pitre, on the experimental farm Dominica and St Lucia were easily reached by regular sailings, but in order to reach Martinique without excessive delay it was necessary to employ a sloop. After the occupation of stations at these last places, illness of the observer made an immediate return imperative, and accordingly passage was taken for New York on May 1

Table 33 shows the stations occupied, with the dates of occupation and geographic positions, for additional details see Descriptions of Stations and Table of Results

TABLE 33

No	Name	Date	Lat North	Long East
		1922	° ′	° ′
1	*Charlotte Amalie*, St Thomas	Mar 10–11	18 20 5	295 05
2	*Christiansted*, St Croix	Mar 18,20	17 45 0	295 17
3	Frederiksted, St Croix	Mar 22,23	17 43 1	295 07
4	*Basse Terre*, St Christopher	Mar 29	17 17 9	297 17
5	*St Johns*, Antigua	Apr 3– 4	17 07 0	298 09
6	La Jaille,[a] Guadeloupe	Apr 12–13	16 16 0	298 27
7	*Roseau*, Dominica	Apr 17,19	15 18 0	298 38
8	*Port Castries*, St Lucia	Apr 25–26	14 01 1	299 02
9	*Fort de France*	Apr 29	14 35 9	298 55

[a] About 5 kilometers from the station of 1905

J T. HOWARD, ON MAGNETIC WORK IN WEST INDIES AND SOUTH AMERICA, DECEMBER 1922 TO DECEMBER 1923

(1) AS A MEMBER OF J W GREEN'S PARTY IN WEST INDIES AND NORTHEASTERN COAST OF SOUTH AMERICA

In accordance with instructions from the Director dated December 23, 1922, I left Washington for New York City on December 26 to begin work in South America, first, under the direction of Mr. J W. Green as a member of his party and, later, working independently reporting directly to the Office at Washington

My outfit consisted of magnetometer-inductor 28, pocket chronometer 50,098, and three watches, observing-tent, camera, and the usual field accessories After attending in New York to the necessary passport formalities, I embarked December 2 on the *Maraval* of the Trinidad Line directly for Port of Spain, Trinidad, British West Indies, where I arrived on January 7, 1923

After first calling upon the crown surveyor, Mr J W. Macgillivray, who was greatly interested in this as well as in earlier expeditions of the Department which have visited Trinidad, I proceeded with observations at the station of 1905 and vicinity until the arrival of Mr Green, who was just completing observations along the coast of Venezuela Mr Green arrived on January 15, and our joint operations are further described in his report (see pp. 153–154)

As the surveying in the wooded portions of Trinidad is done by use of the compass, the crown surveyor requested that distribution stations be occupied in remote parts of the island Over a country of rough topography and covered with rank tropical vegetation, compass surveys are most expeditious, provided there is little or no local disturbance The success of the surveys in Trinidad undertaken in the past by this method indicated the absence of such disturbance The presence of two magnetometer outfits by which simultaneous observations in widely separated parts could be made presented a favorable opportunity for determining the matter definitely Stations at Port of Spain and San Fernando, first occupied in 1905, were reoccupied in January, and new stations at Rio Claro and Toco were established On the return of the party from the Orinoco River trip I made extended observations of declination at Cedros February 27 and 28, while Mr Green carried out diurnal-variation observations at Port of Spain, thus securing simultaneous observations at the two places

At Bridgetown, Barbados, a class I station was made January 25–26, the diurnal variation in horizontal intensity and declination being made by Mr Green while I made the observations for variation in inclination at an auxiliary station, thereby getting simultaneous variations of all elements After completing this work we obtained transportation by means of a small sloop to Kingstown, St Vincent, where the station of 1905 was reoccupied Returning to Port of Spain, preparations were made for work on the Orinoco Leaving Port of Spain on a Venezuelan steamer, we arrived at Ciudad Bolivar, Venezuela, after a slow voyage caused by the unusually low stage of water in the river, which made travel at night impracticable. Here we landed and entered our outfits after a brief and courteous inspection by the customs officials We were able to exactly reoccupy the C. I. W. station of 1913, and, though the station has been given the name of Ciudad Bolivar in the State of the same name, it is actually across the river in the State of Bermudez Further progress up the Orinoco being impracticable, as explained in detail in Mr Green's report (see p 154), we returned to Port of Spain. The water in the river was lower even than when we came up. The steamer, loaded with cattle and carrying many passengers, grounded on a bar Such an accident going down-stream and the water rapidly falling promised to be a serious matter, but fortunately with the timely assistance of another boat we were drawn off without great damage.

From Trinidad we sailed to Georgetown, British Guiana, where we reoccupied the C I W station on March 6 and 7. I reoccupied also the station of 1908 at Bartica while Mr Green reoccupied the station of 1908 and 1918 at New Amsterdam as supporting stations We proceeded thence by French mail steamer to Paramaribo, as a supporting station, we reoccupied jointly the station of 1908 at Onverwacht. We then took passage on a local steamer for St Laurent on the French Guiana side of the Maroni River The formalities of entering our baggage and equipment were very numerous and difficult, however, once our mission was explained, the military and civil officials were most cordial and helpful. French Guiana is a penal colony, and the visitor can not fail to be interested in the various types of men with whom he must deal The man who carts his baggage may have been a desperate criminal, or may be a man of education and culture whose fault has been political The fishing trade is controlled by Annamese who have brought with them their peculiar traditions and living habits, while transportation on the river is largely in the hands of the "bush niggers," descendants of African

slaves who long ago escaped their Dutch and French masters and have reverted to their tribal life in the jungle After reoccupying the station at Cayenne, we fortunately obtained passage on a cattle boat for Para, Brazil We jointly reoccupied the station at Pinheiro as a class I station, after which Mr Green went to Alcobaça to reoccupy the station of 1915, and I began preparations for the work on the Xingu River

Table 34 shows the stations occupied by me with dates of occupation and geographic positions, those occupied by Mr Green being given in a table appended to his report, for additional details, see Table of Results and Descriptions of Stations

TABLE 34

No	Name	Date	Latitude		Long East	
		1923	°	′	°	′
1	*Port of Spain, 1905*, Trinidad	Jan 9–10	10	40 0 N	298	28
2	Port of Spain, *B*, Trinidad	Jan 11–16	10	40 0 N	298	28
3	San Fernando, *B*, Trinidad	Jan 19	10	16 8 N	298	33
4	Bridgetown, *B*, Barbados	Jan 25–26	13	04 8 N	300	25
5	Kingstown, *B*, St Vincent	Jan 29	13	09 2 N	298	46
6	Rio Claro, Trinidad	Feb 8	10	18 0 N	298	50
7	Ciudad Bolivar, *B*, Venezuela	Feb 14–16	8	09 1 N	296	26
8	Cedros, Trinidad	Feb 27–28	10	05 3 N	298	07
9	*Georgetown*, British Guiana	Mar 6– 7	6	48 6 N	301	51
10	*Bartica*, British Guiana	Mar 9	6	23 8 N	301	25
11	*Paramaribo*, Dutch Guiana	Mar 17–20	5	50 2 N	304	50
12	*Onverwacht*, Dutch Guiana	Mar 21	5	34 6 N	304	50
13	St Laurent, *B*, French Guiana	Mar 30	5	29 4 N	305	59
14	Cayenne, *B*, French Guiana	Apr 10	4	56 1 N	307	40
15	*Pinheiro*, *B*, Brazil	Apr 18–19	1	17 9 S	311	31

(2) IN BRAZIL, ON XINGU AND FRESCO RIVERS, MARAJO ISLAND, TROMBETAS, PARU, AND JARY RIVERS

As Mr Green, with whom I had been associated, began his work along the eastern coast, going southward to Argentina, I began preparations for work on some of the Amazon tributaries along which there had been no previous magnetic observations The first of these was the Xingu River, which lies between the Araguaya River on the east, traversed in 1915 by Observer D W Berky, and the Tapajoz on the west, ascended by Observer Allan Sterling in 1918 The Xingu River is navigable by steamers to Victoria, from there one goes by mule train over the portage to Alta Mira, avoiding three large, impassable rapids At Alta Mira I secured passage on a launch belonging to a local rubber company to the head of launch navigation at São Felix From this point I was able to arrange a canoe trip up the Rio Fresco, a tributary of the Xingu, to Novo Horizonte at the edge of the plains or "campos" Long delays occurred on the return to Alta Mira because of the low stage of the water Stations were established as opportunities afforded, both on the outward and return journeys At Victoria I was fortunately able to catch a steamer again for Para, where I arrived July 13 The entire trip had taken 64 days, during which nine new stations had been estbalished

At Para an opportunity was presented of accompanying Mr Fischer, of the Philadelphia Academy of Natural Arts, to the island of Marajo This expedition started from Para August 3 and returned August 14, during which time stations were established at Souré and at Maguary Lighthouse

As there seemed no present possibility of making the ascent of the Paru River, I made preparations to proceed up the Amazon After making observations at Obidos, an opportunity was found to ascend the Trombetas River about 150 miles to the first cataract at Porteiro Rapids, three new stations being occupied I then returned to Santarem and, after reoccupation of that station, I learned that official permission would

be given for ascending the Paru and Jary rivers I accordingly returned to Para to secure the necessary outfit and to make up the party My party was composed of native Brazilians except one, who was an American prospector from San Francisco We left Para on September 26 for Almeirim, where we picked up two more natives and the real hard work began

We had no maps or other reliable information, and the journey was very slow and laborious on account of the numerous rapids (we encountered 53 on this trip), the first at Panama Rapids being reached on October 6 On the way we met an old rubber trader, who gave me a helpful introduction to the Indians and furnished us with very valuable information and assistance Guided by the Indians, I arrived on November 26 at the border of the campos country Here the guides talked of dangers ahead, of enormous beasts and savage tribes, and refused to go farther This point was about 0° 16′ north latitude, and without the assistance of the Indians I could not well proceed So I persuaded them to show me the trail across the mountains to the Jary River, which they said was a two days' journey I was obliged to abandon my canoes, cable, and heavy gear, and started across the trail with my Brazilian boys guided by the Indians who spoke no language but their own Instead of the expected two days, we walked over a very rough country for four days There was no trail, only a very indistinctly blazed line Our provisions were about gone, and we lived largely on game, mainly monkeys, and Indian bread The streams were small, and there were no fish Arriving at the Indian village on the Jary side of the divide, I was able to arrange with the chief to take us down to a larger place, where canoes could be obtained for the descent to the Amazon.

In accordance with agreement, we arrived at the village of the Chief Creshapee on the Potinga River This old chief was a man of distinguished ability who carries on a trade with the French in Guiana by way of the upper Maroni He had himself on one occasion been over to St Laurent The tribes of this region deal very little with the Brazilian traders, preferring rather to trade with the tribes from over the Tumac Humac range The Brazilian Indians raise large numbers of dogs, while the Indians of French and Dutch Guiana raise very few and are willing to pay excellent prices for them in barter—beads, knives, cloth, etc After paying Chief Creshapee about all of my remaining barter for the trip, I proceeded with my observations, while the women of the village made up a great quantity of a sort of hardtack for provisions on the next stage of the journey On the day following, December 4, with my men (five Indians) and two canoes, we started for San Antonio, a Brazilian rubber-trading post It was a pleasant trip down-stream, with few rapids and only one portage We were well supplied with food, the climate was pleasant, and the course lay through a rich, untouched country At the end of eight days we came to San Antonio, where there is a tremendous cataract, but the Brazilians have built a good road and burros are provided to carry baggage Here I paid off my Indian boatmen, made them presents, and bade them farewell They departed in a cheerful mood, and I am sure that a future observer will find a hearty welcome among them

The director of the rubber station, Senhor Lopes, received me and my white companion very cordially and found a house where we could get board while waiting for the launch The Brazilian boys were well sheltered and cared for themselves with food I bought for their use On the arrival of the launch on December 16, we were able to proceed down the river as far as Arumanduba at the mouth of the Jary, built in a half-submerged swamp, where the houses are set up on posts, and where malarial fever is abundant and mosquitoes innumerable At that time the food-supply had run short and we lived largely on fish, though I managed to secure a few chickens for variety After a few days' delay we secured passage for Para, where we arrived December 26 Here the boys were paid off and the party disbanded. In spite of the continual use of quinine, I had contracted malaria and was obliged to go to the hospital, where I was on New Year's Day.

A word of appreciation should be added for the Brazilian boatman He is tough and elastic as the rubber with which he commonly deals He will go anywhere if he has plenty of farina and tobacco, without either, he is lost Moreover, as a rule, he will not steal, though he sometimes twists the facts in his stories His greatest virtues are courage and cheerfulness, he sits down to his monkey meat and farina, and chats happily with his comrades and goes to bed singing, whether or not he knows where his next meal is coming from

In the Paru River region it is probable that the lava which overlies the river bed causes local disturbance The Indians have a tradition that the river issues from a circular lake of unknown depth, but the source of their information is uncertain, as they are afraid to go up there It is interesting, however, to observe that, while the Trombetas, the Cumana, and the Jary are very nearly dry in November, there is an abundance of very clear water in the Paru Moreover, it is natural to suppose that the shining, brittle, red and black enamel which overlies the granite in the valley has flowed down from its source in the mountains In the lower river this overlying material is not seen

TABLE 35

No	Name	Date	Latitude	Long East
		1923	° ′	° ′
1	Cachoeira Tucuruhy	May 16	3 01 S	307 45
2	Alta Mira	May 18	3 12 5 S	307 48
3	Jatoba	May 24	4 51 6 S	307 13
4	São Felix	May 30–June 1	6 38 8 S	308 01
5	Estreeto	June 8	6 59 1 S	308 17
6	Novo Horizonte	June 14–15	7 43 6 S	308 49
7	Capivara Cachoeira	June 18	7 24 3 S	308 46
8	São Sebastião	June 30–July 2	5 48 S	307 24
9	Victoria	July 9	2 53 5 S	308 00
10	*Pinheiro, A*	July 15	1 17 9 S	311 31
11	Maguary Lighthouse	Aug 6	0 14 8 S	311 40
12	Souré	Aug 12	0 44 0 S	311 34
13	*Obidos, A*	Aug 26	1 55 0 S	304 32
14	Oriximina	Aug 28	1 45 7 S	304 08
15	Porteiro Rapids	Aug 30	1 05 1 S	302 58
16	Veado	Sep 1	1 19 2 S	303 31
17	Obidos, *B*	Sep 5	1 55 0 S	304 32
18	*Santarem, A*	Sep 8–14	2 24 9 S	305 21
19	Santarem, *B*	Sep 11	2 25 0 S	305 21
20	*Almeirim*	Oct 1	1 32 0 S	307 32
21	Panama Rapids	Oct 5– 6	1 03 7 S	306 54
22	Muraeeka	Oct 12	0 57 4 S	306 52
23	Maracanaquara Rapids	Oct 17,20	0 44 6 S	306 50
24	Miritipoco Island	Oct 26	0 27 7 S	306 27
25	Jawaré	Oct 29	0 16 0 S	306 18
26	Tapiocawa	Nov 7	0 10 4 S	306 19
27	Touré Falls	Nov 12	0 01 6 N	306 15
28	Papagaia Village	Nov 19,21	0 37 0 N	305 43
29	Curumuri	Nov 26	0 16 0 N	306 07
30	Pata	Dec 3	0 24 3 N	306 34
31	Jawaré Pootoolé Island	Dec 7	0 01 9 N	307 03
32	Takara Rapids	Dec 10	0 28 7 S	307 18
33	São Antonio de Cachoeira	Dec 12–13	0 39 9 S	307 31

It is a pleasure to acknowledge the uniformly courteous assistance rendered by officials and others in position to help with the work of the expedition Especial mention must be made of the assistance rendered by the American consul at Para, Mr George H Pickerell, and by Mr Edgar Chermont and Mr Bento Chermont

Table 35 shows the list of stations occupied after leaving Mr Green's party (all in Brazil), with dates and geographic positions, for additional details, see Table of Results and Descriptions of Stations

J T HOWARD, ON MAGNETIC WORK IN BRAZIL, PERU, AND ECUADOR, JANUARY TO OCTOBER 1924

During 1924, as late as October 27, when I returned to Washington, I continued work under instructions of December 23, 1922, and supplementary instructions of November 1923 On the completion of the expedition up the Paru and Jary rivers, at the end of December 1923, I was compelled to take hospital treatment at Para, before going on with the work As soon as able, I went direct from Para to Manaos, where I reoccupied the repeat station on January 23, 1924 Here I found the facilities for working along the major tributaries very meager, and such work as I was able to do was accomplished with great loss of time, waiting for transportation

On February 1, I embarked on a launch for a trip up the Rio Negro, one of the major tributaries entering the Amazon from the north, said to be nearly 40 miles wide at its mouth and about 10 miles wide at Santa Isabel, about 400 miles up from Manaos These great widths are hidden from direct observation because of the numerous large islands which divide the water-course into various channels The division of the year into seasons of widely different amounts of rainfall causes a very great change in the water-level, reported to be as much as 70 feet at Manaos The water is discolored by the large amount of decayed tropical vegetation, until it has much the appearance of coffee where it breaks at the forefoot of the boat. The stations at Santa Isabel and Barcellos were reoccupied on this trip

On my return from the north side of the Amazon, I immediately made arrangements to go to Porto Velho on the Madeira River, the mouth of which, where it enters the Amazon from the south, is almost opposite that of the Rio Negro I left Manaos on March 2, and arrived at Porto Velho on March 6, where I was met by Mr MacDonald, of the Madeira-Mamore Railway Company Porto Velho is headquarters for the railway company All the buildings are on the company's property, forming the new town quite separate from the old town, which has much in common with all Brazilian towns Active work on the railway began about the time the Panama Canal was nearing completion, and it is evident that much of the style of building and the methods of engineering have been adopted from the experience obtained at Cristobal and Balboa

On the day following my arrival I took the train for Guajara Mirim, on the Bolivian frontier, arriving there on the night of March 8. Observations were made at Guajara Mirim on the Brazilian side, and at Guayaramerin on the Bolivian side The latter is the original Indian name and means "the little noise" in distinction from larger rapids farther down called "the big noise " The existence of these two towns, named respectively from the Portuguese and the Spanish, accounts for the variations in the spelling of the name on maps and in other publications

I returned to Porto Velho as quickly as possible in order to catch the steamer for a return to Manaos. But the steamer had met with a mishap and did not come for 18 days I occupied two stations at Porto Velho, and was obliged to spend a few days in a hospital, so that it was April 5 when I got back to Manaos

There is but one steamer per month from Manaos to Iquitos on the upper Amazon in Peru, and therefore little opportunity for stopping for observations at intermediate points I embarked on April 10 on one of the largest of these Amazon steamers, the *Belem*, a very comfortable boat, though slow, and planned to take chances on making observations at wood stations en route This steamer burned wood and required 10,000 sticks every 24 hours, a considerable quantity when seen in one pile This wood was replenished once each day, but as the stops for refueling were generally in the night, or in a pouring rain, little observational work was possible Nevertheless, at three stations I got ashore and did a little work, and at São Paulo I got an approximate reoccupation of an old station.

On April 24 we arrived at Iquitos, Peru, which I occupied as a class I station. There was under consideration a government project to build a railway from the Pongo de Manseriche over to Piura An English engineer had been sent over from Lima to go through the upper Marañon and over the Andes on a preliminary survey The authorities, learning of my plans to go on through to the Pacific coast, had requested me to accompany this man, who had no equipment for determining geographical position, so I waited, expecting to leave on May 9 A local insurrection made it impossible for us to make use of the navy launch and the project had to be postponed My delay had caused me to miss the monthly mail boat up the Ucayali River, and there was nothing to do but wait for the next one on June 1 On that date I left Iquitos on the launch *Esploradora* It is a big launch, but it was crowded with passengers, all of whom had to sleep on the deck There was not much room to walk around at night. Most of these passengers got off at points en route Arriving at Baños, we found a rapid that the big launch can not pass at low water, so all remaining passengers were transferred to a very dilapidated craft, by courtesy called a launch The mail sacks, made of light material, were carried in a canoe lashed alongside, where they were often splashed with water, a circumstance not intended to improve the legibility of the letters

On Friday, June 13 (quite appropriately) the ancient engine broke down, giving an opportunity for observations at the mouth of a small stream called Puma Yaca The next day we came to the remnants of the American colony of Californians who were persuaded to join in a scheme to raise cotton on the Pachitea River, where a concession had been obtained by the promoter But there had been internal dissensions and nearly all who had means to leave had done so Finally, on June 15, the old engine expired with a blaze of fireworks and a great noise, and we started on at the streak of dawn in one of the canoes We had been adequately fed on the big launch, scantily fed on the launch which we had just abandoned, and now we were limited to bananas and salt fish To this I was able to contribute a small amount of game Nine days in the canoe brought us to Puerto Bermudez, a collection of palm-thatched sheds, the head of navigation of the Pachitea River Observations were made at two stations, though the station of 1912 could not be recovered exactly, because, in 1914, Indians had destroyed the town and burned the buildings On June 30 we took mules for the overland portion of the journey The first day it poured rain and the first river crossing was impossible The mules were unpacked and made to swim over, while our outfit was taken across on a raft or "baka" After eight days of mule travel we arrived at La Merced, and an auto bus was taken to the railway at Oroya, whence the journey was quickly made to the Huancayo Observatory, where I arrived on July 8 Thus the journey from Iquitos to Huancayo had taken more than five weeks, and was in many ways an unpleasant experience

Careful comparisons were made with the standards at the Huancayo Observatory These were extended over an unusually long time, because of the extra observations required of the limited personnel at the observatory After taking a short vacation and making observations at Tarma, La Merced, and at San Lorenzo Island near Callao, passage was taken for Paita, northern Peru, where I arrived on August 29 Here the climate is perfectly dry and during my stay the wind blew with great force every afternoon This was the cause of an unfortunate accident to the earth inductor which prevented further observations for inclination Nevertheless, I went to Piura and occupied two stations, omitting inclination, and then proceeded to Guayaquil, Ecuador, where I arrived on September 6

There was an insurrection or revolution in progress in the interior, and my going on to Quito was hindered on that account I finally got to Riobamba on the railway on September 15, and reoccupied the station there. The region is highly disturbed

and a precise reoccupation was very important The station was on a little hill which is the personal property of a man who demanded 50 sucres for the privilege of reoccupying it On securing his pledge to see that the station marker was undisturbed, I paid the price I then proceeded to Quito, where I interviewed the American minister and other officials, reoccupied the station as far as possible with my damaged instrument, and returned to Guayaquil on October 4, 1924 I took passage on October 7 for New York and arrived in Washington on October 27, after an absence of 22 months

Table 36 shows the stations occupied in 1924, with dates of occupation and geographic positions, for additional details see Descriptions of Stations and Table of Results

TABLE 36

No	Name [a]	Date	Lat South	Long East
		1924	° ′	° ′
1	*Manaos, A*	Jan 24–26	3 08 5	300 00
2	*Barcellos, A*	Feb 4	0 58 2	297 07
3	Barcellos, *B*	Feb 5	0 58 2	297 07
4	*Santa Isabel*	Feb 9–10	0 25 0	294 58
5	*Manaos, A* (see No 1)	Feb 19, 21	3 08 5	300 00
6	Guajara Mirim	Mar 9–11	10 40	294 41
7	*Guayaramerin*	Mar 10	10 48 1	294 41
8	*Porto Velho, A*	Mar 14–15	8 45 6	296 05
9	Porto Velho, *B*	Mar 15	8 45 6	296 05
10	*Manaos, B* (see Nos 1 and 5)	Mar 1–Apr 10	3 07 6	299 58
11	Bocca do Jutahy	Apr 17	2 42	293 10
12	*São Paulo de Olivença*	Apr 19	3 31	290 59
13	Chimbote de Amazonas	Apr 22	4 00 0	280 09
14	*Iquitos, A*	Apr 26–May 15	3 45 6	286 45
15	Iquitos, *B*	Apr 27	3 45 6	286 45
16	Quebrada Puma Yaca	June 13	9 16 9	285 10
17	*Puerto Bermudez, A*	June 24–25	10 17 8	285 13
18	Puerto Bermudez, *B*	June 26	10 18 9	285 13
19	*Huancayo Observatory*	July 10–28	12 02 7	284 40
20	*La Merced, A*	Aug 3– 4	11 03 9	284 39
21	La Merced, *B*	Aug 4– 5	11 03 9	284 39
22	*Tarma*	Aug 7– 8	11 26 0	284 18
23	*San Lorenzo Island*	Aug 26	12 05 5	282 49
24	*Paita*	Aug 30	5 04 7	278 54
25	*Piura, 1912*	Sep 2	5 11 7	279 23
26	Piura, *B*	Sep 3	5 11 4	279 22
27	*Guayaquil*	Sep 10	2 10 8	280 09
28	*Riobamba, A*	Sep 17–18	1 39 5	281 18
29	Riobamba, *B*	Sep 20	1 39 8	281 19
30	Riobamba, *C*	Sep 20	1 39 8	281 19
31	*Quito, B*	Sep 26–27	0 13 1	281 28
32	Quito, *A*	Oct 1	0 13 1	281 29

[a] Of the above stations, Nos 1 to 12 are in Brazil, except No 7, which is across the river in Bolivia, Nos 13 to 26 are in Peru, Nos 27 to 32 are in Ecuador

SUGGESTIONS

Considerable time could be saved and more accurate longitudes determined in the field if the observer carried a radio outfit Small powerful sets are now available which could be carried without adding much weight to the observer's baggage Much time could be saved in obtaining signals directly and the constant worry and trouble of carrying many watches in the field could be done away with If chronometers and watches are used, care should be taken to see that they are in good condition before leaving the observatory, *i e*, that they have been oiled and cleaned within at the most six months At the best, the pocket chronometer is too fine an instrument for carrying on mule-back trips, as the chances are that it will stop or have a very irregular rate, due to the constant jolting

JOHN LINDSAY, ON MAGNETIC WORK IN MEXICO AND CUBA, JUNE TO SEPTEMBER 1924

In accordance with instructions from the Assistant Director dated June 7, 1924, I left Washington on June 8 with Mr J W Green, who was chief of party, for magnetic work in Mexico My instrumental outfit consisted of magnetometer-inductor 27, pocket chronometers 50,107, and 260, watches 811, 8282, and 105, observing-tent 38, and miscellaneous equipment.

We entered Mexico at Piedras Negras, crossing the Rio Grande from Eagle Pass, Texas From Piedras Negras we went to Sabinas and reoccupied the magnetic station of 1907, notwithstanding the extreme heat, the temperature rising to 111° F The intendente or mayor of the town was most courteous in extending permission and placing several policemen and an automobile at our disposal We thanked him and accepted the services of one policeman Sabinas itself was a small "puebla" typical of the northern Mexican villages, being hot, dry, and dusty On arrival we moved into the only hotel, where we were given a large room and told by the señora that there would be electric light installed "mañana," meanwhile she would see if she could find a candle After a night, during which little sleep was possible, due to the heat, noises of animals, and the clanging of a church bell during the early morning hours, we proceeded to Monterrey, where a class I station was established

On June 22, at Mexico City, we were met by Professor Juaquin Gallo, director of the National Astronomical Observatory, who had very kindly made all arrangements for our stay After a conference with Dr Gallo and Mr Sandoval, his assistant, Mr. Green and I proceeded south 131 miles to Puebla It was decided that I should occupy Puebla and Oaxaca as class II stations, while Mr Green returned to Mexico City to carry out a series of intercomparison observations with the standard instruments of the observatory After completing the work at Puebla I proceeded to Oaxaca by rail on June 29

At Oaxaca a close reoccupation was made of the C I W station of 1907 Oaxaca itself was interesting in that it contains an old Spanish cathedral built in 1537, and near the city is the great tree of Tule, 120 feet in diameter and 160 feet high, here also are the ruins of Mitla

I returned to Mexico City and went over my records with Mr Green for further suggestions as to my future field work The comparisons at the National Observatory having been completed, we left for Queretaro on July 11, where we established a class IV station and several auxiliary stations in the immediate vicinity on account of local disturbance

The methods of carrying out the work of magnetic survey in the field having been acquired under Mr Green's direction at stations already occupied, we separated at Queretaro, Mr Green proceeding to Guadalajara and northwest Mexico to occupy several stations before returning to Washington, while I turned eastward, going first to San Luis Potosi, at which place I obtained a close reoccupation of the Mexican magnetic station of 1922 I then proceeded to Tampico, where I established a class IV station on the grounds of the American hospital about 6 miles from the center of the city Much time was saved in selecting the site for my magnetic observations here by an airplane trip over the city, given through the kindness of Mr Mallory On July 25 I embarked on a Ward Line steamer for Vera Cruz, where a new station was established

On inquiry, I found there were two routes available for the journey from Vera Cruz to Puerto Mexico, the next stop on my itinerary, one being by rail and the second by small boat on the Mexican Gulf The officials at the American consulate strongly advised me to make the trip by water Word had been received of the poor condition of the railroad to Santa Lucretia, where the road from Mexico City by way of Cordoba

joins that across the Isthmus of Tehuantepec No information was available concerning the Santa Lucretia-Puerto Mexico portion of the Tehuantepec road, which comprised the second lap of the overland journey. Bandits had been active in that section and several trains had been stopped and the passengers robbed and in some cases killed However, after hearing the usual "mañana" from the captain of the only available small sailing craft, when I would make daily inquiries as to the date of sailing, I finally decided on the rail route and left on the train for Santa Lucretia at 6 a m on July 29 The road bed was poor and Pullman cars were not known on the line The first-class passengers were a Spanish family traveling with a four-months-old baby, a Señor Laza, and myself After a hard day's ride the train was stopped for the night in a swamp somewhere in the state of Vera Cruz Señor Laza and I arranged a resting-place by reversing a wooden bench and adjusting a mosquito net, then, after obtaining some "tortillas" and "frijoles" from a ragged peon vendor, endeavored to obtain some much needed rest The mosquitoes were numerous and the net of little use The second-class passengers were walking back and forth endeavoring to avoid the bites of the insects. Finally, when the confusion made sleep impossible, Señor Laza and I followed the example of the other passengers in an all night parade.

The following day at noon, after passing through dense growth and jungle, we arrived at Santa Lucretia, the junction-point on the Isthmus of Tehuantepec The train for Puerto Mexico was due at 1 p m It arrived at 7 p m , to the surprise of every one, as it was not really expected until the following day Señor Laza and I were now the only first-class passengers, and boarding the train found four cars having board seats over which many roaches were running, to add to the discomfort caused by the mosquitoes and other insects We both managed to fall asleep, only to be rudely awakened by the sudden stopping of the train and by a rush of the second-class passengers through our coach We immediately thought of bandits, but kept our seats until the rush of peons had ended Darkness enveloped everything, as the swaying of the train had extinguished the oil lamps Reaching the rear platform, I discovered that a peon had been struck by the train and both legs severed above the knees The passengers were unwilling to offer assistance for fear of being arrested, according to the laws of the country, in case the man should die Nevertheless, I rendered such first aid as I was able and placed the man in the car, where he was taken to Puerto Mexico

My work at Puerto Mexico was greatly facilitated by Dr John J Sparks, the British consul and by Mr Paul Weaver, chief geologist of the Aguila Oil Company After several days' delay, I obtained passage on a small coastwise boat for Frontera, arriving on August 15 and establishing a class IV station the following day I then left on a river steamer for Ciudad del Carmen The trip to Campeche was made by sail-boat, on which, as soon as we lost sight of Ciudad del Carmen, we were met by a thunder-storm The lightning was intense and the rough sea was too much for the small craft, which was tossed upon a sand-bank near Isla Aguada There we remained until mid-night, when we finally managed to get afloat again with the assistance of a fishing-boat. Campeche, which is one of the oldest pueblas in Mexico, was reached the next evening, August 22

It was a pleasure to travel on a modern fast train to Merida and on arrival to find such a pleasant and clean city as the capital of Yucatan After recovering from a week's illness, caused by drinking bad water on the boat from Carmen to Campeche, a station was established on the grounds of the agricultural school at Chuminopolis, a suburb of Merida Diurnal-variation series in all three elements were obtained and an auxiliary station was established

An inland station was occupied at Chichen Itza, where the archæological expedition under Dr S G Morley had commenced operations in the study of the ancient Maya

ruins As work had been discontinued for the summer, due to the advent of the rainy season, I met none of the archæological party On September 15, I left Progreso on the S S *Monterrey* for Havana, Cuba A station was reoccupied at Casa Blanca, and diurnal-variation observations were made in all three elements

Throughout the trip every assistance and courtesy was extended by the officials of the countries visited The total distance traveled on the trip was 5,550 miles, of which 4,420 miles were by rail, 790 were by steamer, 300 were by small sailing-boat, and 40 were by automobile The total time required was 106 days, thus the average time per station being 5 6 days Of the total distance, 1,980 miles were traveled in reaching Eagle Pass, Texas

Table 37 shows the stations occupied, with dates of occupation and geographic positions; for additional details, see Descriptions of Stations and Table of Results.

TABLE 37

No	Name [a]	Date	Lat North		Long East	
		1924	°	′	°	′
1	Sabinas, *B*	June 14	27	51 4	258	54
2	Monterrey, *B*	June 17–19	25	40 5	259	40
3	Puebla, *A*	June 26, 27	19	03 0	261	47
4	Puebla, *B*	June 28	19	03 0	261	47
5	*Oaxaca, A*	June 30–July 1	17	03 6	263	16
6	Oaxaca, *B*	July 2	17	03 6	263	16
7	Queretaro, *B*	July 12	20	35 0	259	36
8	San Luis Potosi	July 17–18	22	08 5	259	05
9	Tampico	July 22	22	14 9	262	08
10	Vera Cruz	July 27	19	11 7	263	55
11	Puerto Mexico, *A*	Aug 1–11	18	09 7	265	37
12	Puerto Mexico, *B*	Aug 4	18	09 7	265	37
13	Frontera	Aug 16	18	31 8	267	21
14	Campeche	Aug 24	19	50 9	269	28
15	Merida, *A*	Sep 1– 5	20	58 2	270	24
16	Merida, *B*	Sep 5	20	58 2	270	24
17	Chichen Itza	Sep 7– 8	20	41 0	271	26
18	*Havana, A*	Sep 19–22	23	09 4	277	39
19	*Havana, B*	Sep 23	23	09 4	277	39

[a] The stations are in the following countries Nos 1 to 17, Mexico, Nos 18 and 19, Cuba

JOHN LINDSAY, ON MAGNETIC WORK IN PANAMA AND SOUTH AMERICA, SEPTEMBER 1924 TO JUNE 1925

Leaving Havana, September 24, 1924, I arrived at Cristobal, on the Atlantic side of Panama Canal, on September 28 and proceeded to Panama City by rail on the same day After obtaining official permission from the Governor of Panama and locating the C I W magnetic stations at Old Panama, observations were commenced on September 30, during which diurnal-variation observations were obtained for all three elements The soil was found to be slightly magnetic, causing a marked station-difference between the primary and secondary stations Considerable trouble was caused by the sudden temperature changes during the diurnal-variation work, although an extra canopy was used over the tent and other means employed to keep the temperature of the magnets as nearly constant as possible

Completing observations, I spent the few remaining days in bringing computations and accounts to date while waiting for a Grace Line steamer for Lima, Peru The voyage was pleasant even when crossing the equator because of the cold Humbolt Current coming up along the coast from the south At Callao the steamer anchored offshore, as is the custom at the ports along the west coast of South America, and the passengers were taken ashore by small boats or launches

The hipodromo C. I. W. stations at Lima were reoccupied. Two series of diurnal-variation observations of horizontal intensity, inclination, and declination were made, as well as regular observations at both primary and auxiliary stations. Special interest attaches to the variation curves at Lima, near sea-level, on account of the opportunity afforded for comparisons with simultaneous magnetograph records at Huancayo Observatory at about 11,000 feet elevation. A general strike took place during my stay at Lima and all transportation, including trams, autos, and busses, ceased. However, I was able to hire a bicycle, so that my observational program was not interrupted. The two stations occupied at Lima were permanently marked by concrete monuments.

Arriving at Huancayo, October 28, I was greeted by Mr. Booth, of the observatory staff. We immediately drove out to the observatory, where I was met by the observer-in-charge, Mr. Parkinson, and his assistant, Mr. Coleman. Intercomparison observations were made with the observatory instruments.

Returning to Lima by rail, I proceeded south to Mollendo by steamer, arriving on November 14. Stations were established at Mollendo, Arequipa, and Juliaca, at sea-level, 7,500 feet, and 12,000 feet above sea-level respectively. Thus data were secured which will be used in the study of a possible difference in the values of the magnetic elements at different altitudes. At Arequipa an unusual range was found in the inclination curve, the difference between maximum and minimum for the day exceeding 12 minutes.

After leaving Juliaca I proceeded to La Paz, Bolivia, crossing Lake Titicaca by steamer. This lake is the highest steam-navigated lake in the world, being at an altitude of 12,648 feet above sea-level. The steamer made voyages across the lake before the railroad was completed, the parts having been brought from sea-level by mule. Thus the Indians saw water transportation by steam before they became acquainted with the railroad. The banks of the lake are cultivated by the natives, and it is interesting to note the sites of the old Inca ruins on the islands, especially that of the famous Temple of the Sun. After an attack of mountain sickness, and having completed observations at Alto de La Paz, I proceeded to Arica, Chile, by rail. The Governor of Arica was most courteous in extending permission for my observations and in facilitating the work.

Sailing on the S. S. *Lautaro*, a Chilean steamer, I arrived at Iquique on December 23 and thence made observations along the Chilean coast at Iquique, Antofagasta, Copiapo, Coquimbo, Valparaiso, Coronel, Corral and Puerto Montt. From Coronel south the green grass and the trees and shrubbery are a most pleasing change from the barren coast to the north, where, due to the lack of rain, there is no vegetation and one sees only the sand and the bare mountains rising from the shore.

At Puerto Montt, a quaint fishing village and resort, I was awakened in the early hours of the morning on February 27 by a great clamor and noise caused by the ringing of all the church bells and fire gongs in the town. On arising and dressing I discovered that a dangerous fire had started which threatened the entire town, as all the houses and buildings were constructed of wood. The sight was very unusual, the reflection of the fire on the water and the snow-covered mountains in the background making a beautiful though tragic picture. The fire was finally controlled, but not until it had destroyed several blocks of wooden houses and had left many poor families homeless.

Completing observations at Puerto Montt, I took passage on the S. S. *Santiago* for Punta Arenas, the southernmost town in the world. The voyage took eight days and came near being disastrous. During a terrific storm on a dark night the captain endeavored to take the steamer into the inside channels of southern Chile from the Gulf of Penas, with the result that the vessel was carried onto a rock, where it rested momentarily, partially out of water, until the following wave washed us clear and we headed

out to sea The scenery in the channels resembles that of the fiords of Norway The snow-covered Andes rise out of the water on each side of the ship and present a most impressive sight

At Punta Arenas, the Argentine Meteorological Service station of 1913 was reoccupied and permanently marked, and two auxiliary stations were established, one near the primary, the other several miles distant, on the grounds of the Jockey Club The station at Ultima Esperanza established by Mr Sterling in 1917 was reached after a 210-mile trip by a Ford automobile There are no roads, but simply tracks made by the repeated passage of automobiles over the ground, which during the rainy season became impassable Through the hospitality of Mr Morrison, an "estancia" or sheep ranch owner, the stay at this inland point was very enjoyable

On return to Punta Arenas, I obtained passage on a small cattle boat for the Falkland Islands The steamer was flat-bottomed, so that the terrific gales and rough seas so prevalent in that section of the world made the trip a rather trying one Our first port was Rio Grande, on the island of Tierra del Fuego, where I took advantage of the stop to establish a magnetic station on shore On return to the ship I found it completely out of the water, due to the unusually large fall of the tide This explained the use of the flat-bottomed boat

On March 31, 1925, we arrived at Port Stanley, the only town and the seat of government of the Falklands It was very different from the small towns of Latin America, having the aspect of a small English village The inhabitants of these islands are English and are noted for hospitality In my case they certainly upheld their reputation After making diurnal-variation observations at the old British Admiralty magnetic station at Navy Point, which is across the bay from Port Stanley, I established distribution stations at "Between-the-Rocks" and Port Louis The trips to these two latter points were made by pack train The plain is extremely treacherous for riding because of the many marshes and the generally boggy ground In order to reach Port Louis it was necessary to cross the Wickham Heights, a mountain range running across the west island The ride was a difficult one on account of gales with snow and hail, and the steep, rocky trails At Port Louis, through the kindness of Mr Robson, I was able to make an exact reoccupation of a magnetic station which had been established by the party from H M S *Terror* in 1832 and which was later occupied by the party from H M S *Challenger* in 1876

Passage was obtained on the freight steamer *Laguna* for Punta Arenas, where I changed to an Argentine boat which arrived at Santa Cruz, Argentina, on May 8 From the latter point I went to Puerto Deseado by sea, and then to Las Heras by rail, reoccupying Mr Sterling's C I W station of 1917 at each place On return to Puerto Deseado I carried out diurnal-variation observations under the unpleasant conditions of the southern winter, with short daylight hours and low temperature I was glad to reach Puerto Madryn at a more northerly latitude on May 26, and after making class II observations, proceeded by steamer to Buenos Aires, and thence to Bahia Blanca by rail On return to Buenos Aires on June 17, I spent several days in bringing my accounts to date, in planning my contemplated expedition to the north, and in discussing the work with Dr. Burmeister, the director of the Argentine Meteorological Service

The total distance traveled on the trip was 12,866 miles, of which 8,585 miles were by steamer, 3,777 by rail, 420 by auto, and 84 by pack train The total expense of the trip was $2,729 39, and 47 stations were occupied in 28 localities Of these, 12 were class I stations, 7 were class II, 5 were class III, 3 were class IV, and one was an intercomparison station Thus the average expense per station was $58 07 The total time required was 267 days, the average time per station being 5.7 days

Table 38 shows the stations occupied, with dates of occupation and geographic positions, for additional details, see Description of Stations and Table of Results

TABLE 38

No	Name [a]	Date	Latitude	Long East
		1924	° ′	° ′
1	*Old Panama, A*	Sep 30, Oct 1, 3	9 00 2 N	280 31
2	Old Panama, *C*	Oct 2	9 00 2 N	280 31
3	*Lima, D*	Oct 10–21	12 04 3 S	282 58
4	Lima, *E*	Oct 22	12 04 3 S	282 58
5	Huancayo Observatory	Nov 3–6	12 02 7 S	284 40
6	*Mollendo, A*	Nov 15–17	17 01 8 S	287 59
7	Mollendo, *B*	Nov 18	17 01 8 S	287 59
8	*Arequipa, A*	Nov 21–24	16 22 5 S	288 27
9	*Arequipa, B*	Nov 25	16 22 5 S	288 27
10	*Juliaca, A*	Dec 3–5	15 30 0 S	289 51
11	Juliaca, *B*	Dec 3	15 30 0 S	289 51
12	*La Paz, A*	Dec 12,16	16 30 8 S	291 47
13	*Arica, A*	Dec 21	18 28 6 S	289 40
14	Arica, *B*	Dec 20	18 28 6 S	289 40
15	*Iquique*	Dec 24	20 12 7 S	289 50
16	*Antofagasta, A*	Dec 27–29, Jan 2, 1925	23 38 8 S	289 38
17	Antofagasta, *B*	Dec 30	23 38 8 S	289 38
		1925		
18	*Calama*	Jan 4	22 28 3 S	291 03
19	*Copiapo, A*	Jan 11–12	27 22 0 S	289 43
20	Copiapo, *B*	Jan 13	27 22 0 S	289 43
21	*Coquimbo, A*	Jan 19–20	29 57 8 S	288 40
22	Coquimbo, *B*	Jan 21	29 57 8 S	288 40
23	*Valparaiso, A*	Jan 29–30, Feb 2	33 04 4 S	288 25
24	Valparaiso, *B*	Jan 31	33 04 4 S	288 25
25	*Coronel, A*	Feb 8	37 01 9 S	286 51
26	Coronel, *B*	Feb 9	37 01 9 S	286 51
27	*Corral*	Feb 11	39 53 7 S	286 29
28	*Puerto Montt, A*	Feb 13–16	41 29 3 S	287 04
29	Puerto Montt, *B*	Feb 13	41 29 3 S	287 04
30	*Punta Arenas, A*	Feb 28, Mar 2, 5, 22	53 10 4 S	289 08
31	Punta Arenas, *B*	Mar 6	53 10 4 S	289 08
32	*Ultima Esperanza, A*	Mar 10–11	51 41 1 S	287 31
33	Ultima Esperanza, *B*	Mar 10–11	51 41 1 S	287 31
34	*Punta Arenas, C*	Mar 20	53 09 8 S	289 10
35	Rio Grande	Mar 26	53 48 1 S	292 22
36	*Port Stanley, A*	Apr 3–10	51 41 2 S	302 10
37	Port Stanley, *B*	Apr 14	51 41 7 S	302 08
38	Port Stanley, *C*	Apr 14–15	51 41 7 S	302 08
39	Between-the-Rocks	Apr 18	51 48 2 S	301 40
40	Port Louis	Apr 22	51 33 S	301 53
41	*Santa Cruz, A*	May 9–10	50 00 9 S	291 30
42	Santa Cruz, *B*	May 11	50 01 2 S	291 30
43	*Puerto Deseado, A*	May 16–17, May 21–23	47 45 7 S	294 05
44	Puerto Deseado, *B*	May 21	47 45 7 S	294 05
45	*Colonia las Heras*	May 19	46 33 1 S	291 03
46	*Puerto Madryn, A*	May 27,28	42 45 2 S	294 58
47	Puerto Madryn, *B*	May 29	42 45 2 S	294 58
48	*Bahia Blanca, A*	June 13–15	38 46 7 S	297 44
49	Bahia Blanca, *B*	June 16	38 46 7 S	297 44

[a] The stations are located in the following countries Nos 1 and 2, Panama, Nos 3 to 11, Peru, Nos 12, Bolivia, Nos 13 to 34, Chile, Nos 35, 41 to 49, Argentina, Nos 36 to 40, Falkland Islands

JOHN LINDSAY, ON MAGNETIC WORK IN SOUTH AMERICA, JUNE 1925 TO MARCH 1926

On return to Buenos Aires from Bahia Blanca on June 17, 1925, I proceeded to Mercedes, 60 miles by rail due west of the capital, to make class II observations, returning to Buenos Aires on June 24 After completing arrangements and supplying myself

with necessary field equipment, including a .44 Winchester rifle, I started out on the first leg of a long trip into the interior of Paraguay

Leaving Buenos Aires on the international train, which is itself very good, though the road-bed was poor, we crossed over the Parana River by means of a ferry, which carried the train up the river about 4 miles. The route then followed the general course of the Uruguay River approximately 350 miles through a lightly wooded country. The small trees along the river were used for fuel, and at night the sky was lighted by the glow of many fires where farmers were clearing the brush from their land. Just before noon on June 30 I arrived at Monte Caseros, my first station, just across from the point where the boundary between Uruguay and Brazil joins the Uruguay River After making the desired observations, I continued northward by rail to Corrientes, on the Paraguay River. From this time I frequently met persons who remembered Theodore Roosevelt, as I was now following the route of his famous expedition. At Corrientes I took passage on the river steamer and after a pleasant trip arrived at Asuncion, the capital of Paraguay, on July 6

Asuncion, although the capital of Paraguay, is rather inaccessible. The native women smoke cigars in the streets, the peons are exceptionally poor, most of them going about in rags and barefoot, every one drinks "yerba maté" or native tea I obtained permission to work on the grounds of the botanical garden at Trinidad, a suburb, from the director, Dr. Fiebrig, who courteously aided me in locating the 1913 C. I W station. On July 16, I continued up the Paraguay River on the S S *Cuyaba* as far as Concepcion, the second largest town in the republic When I had completed my work there I continued northward on a smaller boat to San Salvador in Alto Paraguay, where I established a class IV station. Through the kindness of the owner, I stayed at the ranch of Mr Tibbett, an Englishman, for several days, while waiting for the river steamer for Corumba. The farther north one goes the wilder the country appears During my few days stay at San Salvador we caught several snakes, shot a fox, and had rather interesting sport shooting "jacarays" or alligators along the river banks The tropical heat was becoming intense, which made field work extremely difficult in the afternoons.

Dr. Roderiquez-Albes, the Brazilian minister at Asuncion, had supplied me with letters of introduction to the customs officials and to the president of Matto Grosso, so that on arriving at Corumba, my first Brazilian station, I had no difficulty in getting my instruments and baggage through the custom-house. This was my first experience with the Portuguese language, which, despite its similarity to Spanish, had many phrases to which my ear had not become accustomed, so that my pleasure on meeting Mr. Ramsey, his son, and Mr Gow-Smith, all of whom were Americans, was especially great Mr Ramsey, who was formerly a Texas sheriff, had charge of a large cattle ranch at Descavades, a point some miles north of Corumba Mr. Gow-Smith, an explorer who had come down from the Explorers Club of New York to make a study of the Indians and to visit the unexplored territory in the heart of Brazil, decided to join my expedition as far as Goyaz After completing observations at Corumba and dispatching my trunk with all unnecessary baggage to São Paulo, we left August 10 on the small river steamer for Cuyaba.

The trip took nine days The boat was poor and extremely dirty. The heat was intense and the mosquitoes were thick. If the heat had not kept us from using the small cabin we had obtained, it would have been impossible to sleep in it anyway, due to the fleas and numerous other insects which infested the place, not to mention the smells from the galley and the continual grinding of the wood-burning engines We therefore used it to store our instruments, rifles, and equipment, while we slung our hammocks on the deck. There were several civilian passengers, including two women, most of the others

were soldiers who spent their time discussing the revolution which was reported to be in full swing near Cuyaba Meanwhile, Mr Gow-Smith and I discussed our probable route and spent the remaining hours in playing checkers on a board we had made, using cartridges for men, trying thus to forget the intense heat and the continual insect pests On August 13 we reached the San Lorenzo River and the following day entered the Cuyaba River Here our troubles commenced The river was extremely low and our boat would no sooner clear one sand bank than it stuck on a second This necessitated several of the crew wading out with a cable, attaching it to a tree farther up and across the stream, and by means of a small donkey-engine dragging the boat several hundred feet farther up the stream. It was a slow, monotonous process

By this time the food-supply was getting low and we were reduced to the usual rice and beans and supplied with a kind of hardtack to take the place of bread. We had reached wild country The bush was quite dense along the banks of the river and alligators could be seen along the shore, and monkeys and beautifully colored birds appeared in the trees

On August 18 our system of cabling up the river had become useless, the water being now but 4 feet deep, and we seemed permanently established on the sand. The next day we transferred to a small motor-boat which had come down from Cuyaba, and continued our journey northward By 3 o'clock the motor-boat stuck, so that we had to change again, this time to native canoes. It was very precarious traveling, as a small sideward movement might send passengers as well as baggage and instruments into the water By midnight we reached a place on the bank which our paddlers told us was the Cuyaba landing It was pitch dark The landing proved to be some rocks at the water's edge After much confusion and shouting some one brought a lantern and we arranged for transportation in an old Ford automobile to the "Great Hotel Gaima" Tired and hungry, we reached the hotel to find no rooms available However, after much discussion with the proprietor, I obtained permission to sling my hammock in the room of a Turk and obtained a disturbed although much needed sleep

In making a general survey of the town the following day in order to determine the most suitable location and site for a station, I visited the Catholic priests who had established a college on the outskirts of the city, at which Padre Ricardo Remetter was carrying on meteorological observations, and the Brazilian magnetic station established on the college grounds in 1904 The site of the station was especially desirable, being in the shade of a large mango tree and well marked by a small pillar I established my main station at this point, making two daily runs for diurnal variation of each element as well as the usual observations The heat made the field observations very trying

The organization of a "comitiva" or pack train for the overland trip to Goyaz proved to be an extremely difficult task Almost all of the desirable mules had been taken over by the Government for the soldiers and the few remaining ones were being held by the owners at an almost prohibitive price, since the natives there as elsewhere had the idea that all Americans have an unlimited supply of money Finally we were fortunate in meeting Colonel Jão Albino, a Brazilian who was one of Theodore Roosevelt's guides, and who at this time owned several good mules After much discussion he consented to let us hire six animals.

Cuyaba had the appearance of an enterprising little city Considering its location so far from centers of civilization and its difficulty of approach, the long river journey from Corumba being the only available route, many things were noticeable For instance, almost every home was supplied with a piano, there was a rather neat appearing plaza on which the municipal band gave concerts every Sunday evening, when the parade of señoritas and jovenes occurred, a cathedral was under construction, and the moving pictures had found the place

After completing the arrangements for our animals, we secured the services of an Indian guide named Militão, and bought the necessary gear, such as saddles and camp equipment, then, taking a supply of rice, beans, and coffee to last us approximately four weeks, we rode off from this outpost of civilization for our trip into the little-known territory of Matto Grosso and Goyaz on September 5 As we did not leave town until 3 o'clock in the afternoon, by nightfall we had covered only about 12 miles and made camp by the side of a small pool We tried sleeping on the ground, but the biting of large red ants and the numerous mosquitoes kept us wide awake, so we gave that up for our hammocks, in which we obtained the needed rest Our animals had been turned loose in order that they might graze during the night, so that in the morning Militão had to "campiar" or track them down At this he proved very efficient, and after the Sun had been up for an hour we had again started on our eastward trail, and by sundown we were in sight of a mountain range which was the beginning of the Matto Grosso plateau. In the morning we passed many large ant hills, some of which were fully 18 feet high At the side of the trail that afternoon we stopped to examine a wooden cross, probably erected for his opponent by the survivor of a fight In the interior a man's gun is law and the best man survives

On September 10 we reached a clearing in the brush known as Rio Manso, consisting of several mud huts and 10 or 12 natives All interest seemed to be centered around one of these huts on our approach After we had made camp by the small stream we learned that 12 bandits or bad men had arrived a little ahead of our comitiva and had also decided to spend the night there These men had been freed from the jail at Cuyaba by the President of the State on condition that they find and kill Morbeck, the diamond king, who at that time was in rebellion against the Government, and considerable fighting had taken place between his men and the State troops The next day I made magnetic and solar observations and we proceeded on our journey late in the afternoon

The following afternoon the 12 bad men overtook our train, and after taking a good look at our rifles and goodly supply of ammunition, "invited" us to accompany them on their mission We spent the next two days with them, and it was with great relief that we finally parted company, as they headed south in their endeavor to locate Morbeck's camp, while we took a northerly route We knew that we were extremely fortunate in still having our ammunition and food-supply Two weeks later at Registro we were told by natives that Morbeck's men had killed all of our late "companheiros."

Our Indian guide, Militão, on the evening of September 15 built a fire which he kept burning throughout the night, explaining that it was a precaution against wild animals, but adding that many such fires had been extinguished by the "surcucudofogo" snake, which is attracted by the light and beats the fire out with its tail On September 17 we reached Sangredoura or Presidente Murtinho, where the padres have established a colony. These priests, entirely isolated from the rest of the world, are accomplishing a great work in the civilizing of the Bororos, formerly a wild tribe of head-hunting Indians I established a magnetic station at the colony while the animals rested and we enjoyed the hospitality of the priests

After five days of continuous riding through the Chevante Indian territory, we arrived at the second colony, which was known as "Colonia Corazon Jesus." The priests there told us that we were very fortunate in our trip, as the Chevantes are a savage tribe and consider the white man a deadly enemy They are also at war with the semicivilized Bororos Completing observations, we continued eastward The next day we were fortunate in cornering two "onças" or Brazilian tigers, and I had my first experience of killing game of this kind After many days in the thick bush, where we encountered many varieties of snakes, the deadly tarantula spider, ant-eaters,

"tigers," and many kinds of birds with beautiful plumage, we arrived at Registro on the Araguaya River, October 1.

While resting the animals a few days I established a magnetic station. After crossing the Araguaya River on October 4, we proceeded on the trail to Goyaz, arriving on October 12, having made magnetic observations at Serredina en route. After disposing of our saddles and equipment, I said goodbye to Mr. Gow-Smith, who was anxious to get to São Paulo immediately, and then started diurnal-variation observations on the former C. I. W. station site at Goyaz, completing the work by October 21.

I then proceeded to Bella Vista, the trip taking two days by Ford automobile over mountain trails through wooded country. Completing observations at Bella Vista, I continued my trip southward to Catalão by auto and rail, arriving on October 26, and reoccupied the station of 1915.

On November 4 I reached São Paulo, and after making observations at Uberaba en route, I obtained my trunk and other baggage, which had been dispatched from Cuyaba, and proceeded to Rio de Janiero for a conference with the Director of the Brazilian Meteorological Service. At his request I made intercomparison observations at the Vassouras Magnetic Observatory from November 9 to 16. On my return to Rio de Janiero I received my first mail in five months, and after reporting the results of the intercomparison work to Drs. Morize and Lemos, I proceeded southward again to Buenos Aires, stopping at Santos, Porto Alegre, and Rio Grande, to make observations.

On receiving instructions from the office to proceed to Washington by the west coast route, I arranged my journey so that I was able to stop at Pilar, the Argentine Magnetic Observatory, for a set of intercomparison observations, at the request of Dr. Burmeister, director of the Argentine Meteorological Service. After obtaining diurnal-variation series at Mendoza, I was able to make good rail connections to the observatory, where I enjoyed the hospitality of Messrs. Wolf and Lutzo-Holm, director and assistant director of the observatory.

On January 22, 1926, I left Pilar for La Quiaca to make a reoccupation of the C. I. W. magnetic station near the Observatory at 12,000 feet elevation. On January 26 a magnetic storm occurred which continued throughout that day and part of the next, making observations useless. Through the kindness of Mr. Valentiner, the assistant director of the observatory, I was able to obtain a set of the magnetograph curves showing the interesting course of the magnetic storm. He was also very glad to obtain my results, as the absolute instrument at the Observatory had been sent to Buenos Aires several months before for repairs. He was able to obtain approximate base-line values from the observations I made.

After crossing Bolivia on the new railroad from La Quiaca to La Paz, I retraced my former route across Lake Titicaca to Juliaca, where I reoccupied my 1924 stations, obtaining class I observations. On February 12 I arrived at Arequipa, where I continued the special study of the interesting and unusual diurnal variation in inclination and established several new stations at which I obtained the daily curves. Sailing from Mollendo on the S. S. *Palena*, a Chilean steamer, I proceeded directly to Guayaquil, Ecuador. There, through the kindness of Mr. A. Ashton, I was able to reoccupy Mr. Howard's station and proceed at once to Quito, where a class I reoccupation was made.

On receipt of cabled instructions to proceed immediately to Guatemala City to meet Dr. S. G. Morley, in order to cooperate with him by making some special solar observations at the old Maya ruins at Copan, Honduras, I returned to Guayaquil by rail and sailed on the S. S. *Mantara* for Balboa, arriving on March 25.

The total distance traveled on the trip was 10,455 miles, of which 4,830 miles were by railroad, 3,300 by ocean steamer, 1,050 by river steamer, 100 by lake steamer, 675 by

mule, and 500 miles by automobile The total expense of the trip was $3,912 12, and 47 stations were occupied in 29 localities Of these 10 were class I, 6 were class II, 4 were class III, 7 were class IV, and 2 were intercomparisons. Thus the average field expense for each locality was about $135 The time required was 278 days, the average time per station being 5 9 days

Table 39 shows the stations occupied, with dates of occupation and geographic positions, for additional details, see Description of Stations and Table of Results

TABLE 39

No	Name [a]	Date	Lat South			Long East	
		1925	°	′		°	′
1	*Mercedes, A, B*	June 22–23	34	40	3	300	33
2	*Monte Caseros*	June 30	30	15	4	302	22
3	*Corrientes, A, B*	July 2– 3	27	28	7	301	10
4	*Trinidad*	July 8	25	15	5	302	26
5	*Concepcion, A, B*	July 19–22	23	24	2	302	34
6	San Salvador	July 28	22	49	4	302	28
7	*Corumba, D, E*	Aug 6, 8	19	00	1	302	21
8	Cuyaba, *A, B, C*	Aug 21–22, 24–27, Sep 2	15	35	8	303	54
9	Rio Manso	Sep 9–10	15	40	2	304	44
10	Presidente Murtinho	Sep 18	15	39	1	306	06
11	Colonia Corazon Jesus	Sep 24	15	33	4	307	02
12	*Registro*	Oct 2	15	43	1	308	13
13	Serredina	Oct 8	15	53	5	308	59
14	*Goyaz, A, B*	Oct 15–18	15	56	5 [b]	309	52 [b]
15	*Bella Vista*	Oct 23	16	59	4	311	05
16	*Catalão, A, B*	Oct 27–28	18	10	8	312	06 [b]
17	Uberaba	Nov 1	19	45	4	312	05
18	*Vassouras*	Nov 9–12, 14, 16	22	24	0	316	21
19	*Santos, A, B*	Nov 24–25	23	57	5	313	36
20	Porto Alegre, *A, B*	Dec 4–5, 7–8	30	02	0	308	46
21	*Rio Grande, A, B*	Dec 12–13	32	01	5	307	52
22	*Colon, A, B*	Dec 22, 24, 26	34	48	3	303	45
		1926					
23	*Mendoza, A, B*	Jan 7–9, 11	32	53	6	291	08
24	*Pilar*	Jan 15, 18, 19–21	31	40	1	296	07
25	*La Quiaca*	Jan 26–28, 30	22	06	6	294	25
26	*Juliaca, A, B*	Feb 7–9, 11	15	30	0	289	51
27	*Arequipa, A, B, C*	Feb 13, 15, 17–19, 21–22	16	22	8 [c]	288	28 [c]
28	*Guayaquil*	Mar 7	2	10	8	280	09
29	*Quito, A, B*	Mar 10–13	0	13	1	281	28 [b]

[a] The stations are in the following countries Nos 1 to 3, and 23 to 25, Argentina, Nos 4 to 6, Paraguay, 7 to 21, Brazil, 22, Uruguay, 26 and 27, Peru, 28 and 29, Ecuador

[b] Mean of two stations

[c] Mean of three stations

JOHN LINDSAY, ON MAGNETIC WORK IN CENTRAL AMERICA, MARCH TO JULY 1926

The S S. *Mantara* docked at Balboa at 11 p m on March 25, the voyage from Guayaquil averaging 7 knots, due to boiler trouble and poor fuel On arrival I immediately made inquiries concerning boats to Guatemala and found that the motorship *City of San Francisco* was sailing the following day, and that I could arrive at Guatemala City about April 5 (no definite information is given by any of the steamship companies) I had missed a fast boat for San José which had sailed the previous day I managed to obtain passage, a Guatemalan visé for my passport and funds from the bank, to dis-

patch my baggage, to notify the Office and Dr Morley by cable of my movements, and was able to reach the dock just before the gangway was lifted

On March 31, at La Union, Salvador, while still on board the steamer, I received cabled instructions from Dr. Morley to disembark and proceed overland in order to reach Copan, Honduras, on April 9, the day on which the astronomical observations were to be made On landing I had many difficulties to overcome I had no ready cash (most of my funds being in letter of credit form), and no visé for Salvador, I found that a four- or five-day Easter fiesta had commenced, which meant that all banks were closed, most of the railroads had stopped running trains, and that it was next to impossible to get any of the natives to do any kind of work (they consider it a sin to work on holidays) However, I managed to make the $5^h 30^m$ train the next morning (the last one that ran), and after traveling 12 hours, arrived at San Salvador No trains were running to Santa Anna, and only after four hours of search I managed to hire an automobile at a fairly reasonable price to make the trip directly to Guatemala City I will never forget that trip and hope never to experience another like it The road was bad, the car overloaded, and at every puebla the road was barred and crosses erected. By daylight we had passed Santa Anna, and although the road was slightly better, the car was stoned and we were hooted for driving on Good Friday Finally, after 24 hours of continuous driving, the trip came to an end and, I had the pleasure of meeting Dr Morley and several of his staff at the Grace Hotel at Guatemala City on the night of April 2

Dr Morley left the following morning for Copan, while Mr Franks and I remained in Guatemala City in order to obtain the boiling-point apparatus, aneroid barometer, chronometers, and watches from the post-office. On April 5 we reached Zacapa by rail The next morning I obtained a chronometer correction from solar observations, and by noon Mr Franks and I had arranged our pack train, consisting of five mules, and set forth on the trail On the morning of April 8 we arrived at Copan, Honduras, where I made observations to determine the azimuth of the line between stelæ 10 and 12 at the ruins, determined the latitude and longitude at both points, the difference in elevation between them and the elevation of the main ruins at the old Maya Plaza Then making a set of magnetic observations at the latter point, I returned to Zacapa on April 17 and made a close reoccupation of the C I. W station of 1907

Leaving the same afternoon, I reached Guatemala City by rail that night After completing class I observations and marking the stations permanently by lettered concrete monuments, I proceeded to San José and reoccupied the C I W station of 1923 On May 7 I sailed for Puntarenas, Costa Rica, on the motorship *City of San Francisco*, arriving on May 20 The steamer was delayed at Acajutla for a week, as the rough seas made loading and unloading impossible and landing very dangerous. However, on May 10, I got my tent and instrument ashore and made an approximate reoccupation of the magnetic station there The tropical heat was oppressive and it was a relief to reach the higher elevation of San José de Costa Rica on May 21 The site of the C I W station was unsuitable, due to the proximity of a tram line, therefore, new stations were established on the grounds of the golf club and class I observations completed, May 26 I obtained passage on a Dutch steamer leaving Porto Limon the following day and arrived at Colon, Panama, on May 28, where class II observations were made Crossing the isthmus by rail, I made my headquarters in Panama. After a conference with Governor Walker, of the Canal Zone, and Mr Malsbury, chief of the Bureau of Surveys, I reoccupied my 1924 stations at Old Panama, and established a distribution station on top of Ancon hill

From June 18 to 25, as delegate for the Carnegie Institution of Washington, I attended the Bolivarian Congress at Panama. Then after establishing two new stations

at Corozal, I sailed on the S S *Tivives* for New York, arriving at the Office in Washington, July 12, 1926

The total distance traveled on the trip was 4,547 miles, 3,640 of which were by steamer, 617 by rail, 150 by automobile, and 140 by mule train The total expense of the trip was $1,390 43, and 14 stations were occupied in 10 localities Of these 3 were class I, 2 were class II, 3 were class III, and 2 were class IV stations Thus the total average expense per station was $99 32 The time required was 109 days, therefore the average time per station was 7 8 days

Table 40 shows the stations occupied, with dates of occupation and geographic positions, for additional data, see Descriptions of Stations and Table of Results

TABLE 40

No	Name [a]	Date	Lat North	Long East
		1926	° ′	° ′
1	Copan	Apr 12	14 50 4	270 55
2	*Zacapa*	Apr 17	14 59 3	270 30
3	*Guatemala, A*	Apr 23–28	14 38 0	269 30
4	*Guatemala, B*	Apr 30	14 38 0	269 30
5	*San José* (Guatemala)	May 4	13 55 5	269 13
6	*Acajutla*	May 10	13 35 2	270 10
7	*San José, E* (Costa Rica)	May 26	9 56 1	275 54
8	San José, *D* (Costa Rica)	May 23–25	9 56 1	275 54
9	*Colon, Washington Hotel*	May 30–31	9 22 0	280 05
10	Colon, *Limon Point*	June 2	9 19 1	280 03
11	*Old Panama, A*	June 7–12	9 00 2	280 31
12	*Old Panama, C*	June 14	9 00 2	280 31
13	Ancon Hill	June 18	8 57 4	280 27
14	Corozal, *A*	June 26–28	8 58 9	280 26
15	Corozal, *B*	June 28–29	8 58 9	280 26

[a] The stations are located in the following countries No 1, Honduras, Nos 2 to 5, Guatemala, No 6, Salvador, Nos 7 and 8, Costa Rica, Nos 9 to 15, Panama

W A LOVE, ON MAGNETIC WORK IN THE BAHAMAS, CUBA, JAMAICA, AND PANAMA, JUNE TO OCTOBER 1922

In accordance with the Director's instructions dated June 10, 1922, I left Washington, D C, on June 19, 1922, in company with my chief of party, Mr J W Green My instrumental outfit consisted of magnetometer-inductor 26, pocket chronometer and three watches, observing-tent, and complete outfit of accessories En route to Nassau, Bahama Islands, the U S Coast and Geodetic Survey stations at Waycross and Miami were occupied From Nassau, under Mr Green's direction, I made trips to Governor's Harbor on Eleuthera Island, Green Cay, Fresh Creek on Andros Island, and Hog Island, where stations were established All other work in the Bahamas, and the reoccupations of the stations at Havana, Cuba, was in company with Mr Green, and is described in detail in his report (page 149)

On August 25, after completion of observations at Havana, in accordance with my original instructions I was put in charge of work to be carried out in Cuba, Colombia, and Central America The stations of 1905 at Pinar del Rio in the western end of Cuba and at Matanzas were reoccupied as closely as circumstances would permit At Placetas del Norte, where the 1909 station was occupied, the alcalde or mayor provided a special detail of police to keep away the crowd, who thought that I was a geologist and brought me samples of minerals for examination

Two stations were established at Camaguey, on the grounds of the Agricultural College, where Dr Luoces, the president, courteously assisted in every way possible At Santiago the 1909 station was closely reoccupied, and an auxiliary station established

on the summit of the historic San Juan Hill The stretch between Placetas and Santiago proved to be magnetically slightly disturbed, possibly because of the character of the soil, which everywhere was of a red ferrous nature A new station was established on the grounds of the U S Naval Station at Guantanamo Bay, where the commandant and officers provided quarters, mess, and facilities for the work

All points in Cuba can be easily reached by rail or automobile, so that both traveling and living conditions compare favorably with conditions in North America

From Santiago passage was engaged on the small steamer for Kingston, Jamaica, where the station first occupied in 1905 by J P Ault and later by other parties was reoccupied New stations were established in Jamaica, at Mandeville, Montego Bay, and Port Antonio, all reached by railroad through the picturesque Jamaican mountains The colonial and local authorities of Jamaica were everywhere most cordial and helpful Because of the difficult character of the country in which the government surveyors have to work, declination values are of great interest No opportunity was found to reach Turk Island and the southern Bahamas from Jamaica, so that project had to be abandoned

On October 23, passage was taken on the United Fruit Company's steamer for Colon, where I arrived two days later and reoccupied C I W stations at Sweetwater and at Washington Hotel, the port officials courteously providing a launch for use in Colon Harbor

The list of stations occupied while in company with Mr Green will be found in Table 28, in connection with his report (see page 151) Additional stations, with dates of occupation and geographic positions, are given in Table 41, for further details, see Descriptions of Stations and Table of Results

TABLE 41

No	Name [a]	Date	Lat North	Long East
		1922	° ′	° ′
1	*Pinar del Rio*	Aug 26	22 25 6	276 18
2	*Matanzas*	Aug 30	23 03 6	278 27
3	*Placetas del Norte, B*	Sep 2– 4	22 20 9	280 22
4	*Placetas del Norte, A*	Sep 4	22 18 6	280 23
5	Camaguey, *A*	Sep 8– 9	21 20 5	282 09
6	Camaguey, *B*	Sep 9	21 20 6	282 09
7	*Santiago de Cuba, A*	Sep 13–14	20 00 2	284 13
8	Santiago de Cuba, *B*	Sep 14	20 00 2	284 13
9	Guantanamo Bay	Sep 16	19 54 6	284 52
10	*Kingston, 1905*	Sep 22,28, Oct 19	17 58 9	283 11
11	Kingston, *B*	Sep 23,28	17 58 9	283 11
12	Kingston, *Secondary*	Sep 26,29	17 58 9	283 11
13	Mandeville	Oct 3	18 01 3	282 31
14	Montego Bay	Oct 5– 7	18 28 5	282 04
15	Port Antonio	Oct 14	18 11 1	283 33
16	*Colon, Sweetwater*	Oct 27	9 21 3	280 03
17	*Colon, Washington Hotel*	Oct 30–31	9 22 0	280 05

[a] Stations Nos 1 to 9 are in Cuba, Nos 10 to 15 are in Jamaica, and Nos 16 and 17 are in Canal Zone

W A LOVE, ON MAGNETIC WORK IN COLOMBIA, NOVEMBER 1922 TO JANUARY 1923

Arriving in Cartagena, Colombia, from Colon on November 3, 1922, I occupied the 1909 C I W station I then accepted an invitation of Mr C Bekker Hansen, of the Cartagena Water Works, Ltd, to make a trip with him to a coconut plantation called La Playona, about 10 miles south of the Panama-Colombia boundary-line The trip was made in a 50-foot schooner equipped with an old-fashioned kerosene engine

La Playona is only 180 miles from Cartagena, but it required 77 hours to make the journey While still in sight of Cartagena the engine failed, and for 30 hours we lay there becalmed Conditions on the little boat were not pleasant, crowded as we were, with the negro crew and native passengers with all their belongings, including cattle, pigs, dogs, and all descriptions of furniture There was but little food on board except what Mr Hansen and I had brought for our own use Gradually a slight breeze came up, and after three days on the Caribbean, we anchored in a small cove, tired, hungry, and in an irritable humor The rainy season for that section of the world had set in, and conditions on the plantation were bad The manager of the plantation was very kind to me during the week's stay of the schooner, providing quarters, help, and a horse, the latter being necessary, as the mess-hall was about 2 miles away from the quarters The return to Cartagena was a succession of engine breakdowns and calms

The trip up the great Magdalena River was next undertaken Calamar, the first stop, was reached by rail from Cartagena, and here poor accommodations, the terrific heat, and swarms of malarial mosquitoes made the stay unpleasant On November 24, passage was engaged on the "palatial" river steamer *Ivor*, propelled by a rear paddle wheel, as were the early Mississippi River boats Each cabin contained only a bare cot, the passengers providing all other necessaries The heat, mosquitoes, unaccustomed cooking of characteristic native foods, chiefly of meats, made the journey most uncomfortable. An 8-mile current, due to the heavy rains in the interior, was running, and it took all the pilot's ability to keep the boat in the channel and to avoid the many snags and uprooted trees brought down by the torrent A number of stops were made to repair the damaged paddle, while every three hours it was necessary to tie up to the bank and load on wood for the burners Numerous alligators along banks provided amusement for the passengers, who shot at them from the decks

A stop for observations at Puerto Wilches was impossible, as the whole section was submerged, and the trip was continued about 20 miles upstream to Barranca Bermeja, where the refinery of the Tropical Oil Company is located The management kindly provided me with quarters and mess Home did not seem so far away on Thanksgiving Day, when a real American turkey dinner was served to all hands A trip to Infantas, 39 kilometers away, where the company has its oil fields, was made in one of their trucks, and an auxiliary station established

From Barranca Bermeja the trip was continued by river steamer to Puerto Berrio, where the 1909 C I W station was reoccupied Medellin was reached by a railroad journey of 14 hours, interrupted where the railroads from the east and west sides of the divide have not been joined, and all passengers and freight must be transshipped around by mules and trucks After official respects were paid, a new station was established here. The difference between the native people on the coastal regions and those in the higher altitudes is at once noticeable The mixed racial type of the low lands, indolent, ignorant, and careless, is replaced in the higher regions like Medellin by a finer type of an industrious and highly developed people

Returning to Puerto Berrio, the trip up the Magdalena River was continued by steamer to the rapids at La Dorada Passengers and freight are here transferred to a railroad running around the rapids to Beltran En route to Beltran, the C I W. station at Honda was reoccupied From Beltran the journey was continued by a smaller type of river boat to Giradot, some 500 miles from the coast, and the last steamer stop on the Magdalena River

The trip by rail from Giradot to Bogota is interesting in every respect One passes from torrid climate to that enjoyed in the northern states in October The grade on this well-built and well-managed road is very steep, three switch-backs being used in one section We ascend from banana plantations to coffee fields, and finally into the pine

belts of temperate zones, and one sees apples and peaches for the first time Overcoats are put on when the savanna at an altitude of 9,000 feet is reached at Facatativa From Giradot to Facatativa the road is a 3-foot gage, thence to Bogota it is a meter gage, thus necessitating a change for both passengers and freight Shortly after leaving Facatativa the road leads on to a broad plain, and one can see miles of fields of wheat and fine pasture lands bordered with tall eucalyptus trees The cool atmosphere is refreshing and exhilarating after the long, hot river trip through the monotonous jungles Bogota is a fairly modern city, of which the Colombian speaks with pride Observations were made in close proximity to the 1909 C I. W station, when cabled instructions directed me to be in Belize, British Honduras, by February 15.

Accordingly, I left Bogota on January 1, 1923, for Ibague, which was reached by rail via Giradot, and there, in company with an American coffee buyer and a Colombian, final preparations were made for the trip to Buenaventura, on the Pacific Coast Experienced travelers in that section warned us against attempting the Quindio pass over the Andes at that time of the year, due to the condition of the trail caused by the heavy rains, but it was decided to go this route It was not long after leaving Ibague that we were convinced they were right. The train consisted of three riding mules and three pack mules. The trail was a perfect quagmire, and time was spent repeatedly in extricating ourselves and the pack animals from deep mud holes The "posadas" or houses where one can find shelter are 12 hours apart, and one must make them or sleep on the narrow trail with a wall of rock behind and a perpendicular cliff in front Oxen laden with

TABLE 42

No	Name	Date	Lat North	Long East
		1922	° ′	° ′
1	*Cartagena*	Nov 7	10 25 8	284 27
2	La Playona	Nov 14–15	8 25 6	282 46
3	*Calamar*	Nov 23–24	10 15 4	285 07
4	Barranca Bermeja	Nov 29–30	7 04 6	286 09
5	Infantas	Dec 2	6 51 7	286 15
6	*Puerto Berrio*	Dec 7	6 29 0	285 36
7	Medellin	Dec 11	6 14 6	284 25
8	*Honda*	Dec 18	5 13 1	285 18
9	*Bogota, A*	Dec 23–25	4 37 6	285 54
10	Bogota, *B*	Dec 26	4 37 6	285 54
		1923		
11	Cali	Jan 11	3 26 6	283 26
12	*Buenaventura*	Jan 14	3 54 1	282 55

coffee were met on the trail at intervals, and in some cases it was necessary to retrace our steps to find a place wide enough to permit the oxen to pass. On the second day we reached the summit at an elevation of 12,500 feet, and thence the trail steadily descended until it reached the tropical forests of the Cauca Valley. At Armenia a stop was made to obtain new mules, as several that we had been using were played out after two days on the muddy trail When possible, we would ride in advance of the pack animals, and on one occasion the pack animal carrying my magnetometer slipped down hill and went over a small cliff The mule arose, seemingly unhurt, dragging his load after him The accident was seen only by the mule-man, who reported the incident that evening The case was badly broken, and the theodolite, although repaired sufficiently to permit its use at Cali and Buenaventura, was badly out of adjustment After five days on the trail, we reached Zarzal on the Cauca River, and then an all-night auto ride brought us into Buga in time to catch the train for Cali Observations were made at Cali, and the 1909 station in Buenaventura, which was reached by rail from Cali, was closely reoccupied The trip farther south to Ecuador and Peru had to be abandoned

in order to reach Belize, British Honduras, by February 15 Accordingly, I left Buenaventura January 16 and arrived in Colon, Canal Zone, three days later Direct transportation to Belize was impossible, two routes only being available, one via New Orleans and the other via Kingston, Jamaica At Balboa I used preventive measures by taking inoculations against yellow fever, as the ports of Central America next to be visited were subject to outbreaks of that disease. After a delay of four days at Kingston, I secured passage for Belize, where I arrived on February 5, 1923

Table 42 shows the stations occupied, with dates and geographic positions, for further details, see Descriptions of Stations and Table of Results

W A LOVE, ON MAGNETIC WORK AND ON DETERMINATION OF GEOGRAPHIC POSITIONS OF CERTAIN MAYA RUINS IN GUATEMALA, FEBRUARY TO APRIL 1923

After my arrival at Belize, as instructed by cablegram received at Bogota, I received supplementary instructions dated February 3, 1923, under which I was to cooperate with a party sent out by Dr Sylvanus G Morley, Associate in Middle American Archæology, for the special purpose of determining within an accuracy of one-half minute the positions of the main group of ruins of Maya cities in the Lake Peten region in northern Guatemala These ruins had been previously visited by Dr Morley and other archæologists, and it was desirable to fix the geographic positions as accurately as possible to prevent their becoming hidden by the rapid tropical growths and so lost to subsequent investigators The light theodolite and methods ordinarily used in magnetic work were thought to be sufficiently accurate for the desired latitude determination, and for observations for longitude determination a suitable time control was provided In such a region, and so far from reliable signals, chronometers were not to be depended upon, and it was decided to attempt the use of a radio receiving outfit As the region in question was in one of the centers of static disturbance, success lay in the use of a long-wave receiving-set Storage batteries were out of the question, and it was uncertain whether dry batteries would withstand the climatic conditions The instrument selected was a standard United States Navy destroyer set with two steps of radio frequency and one of audio frequency amplification, adapted to wave-lengths from 600 to 25,000 meters, and modified to use dry instead of storage cells for the A batteries. The dry cell used was the No 6 Reserve dry cell of the National Carbon Company, which does not begin to deteriorate until water has been added, thus making it possible always to have a fresh supply

Mr O G Ricketson, the leader of the party, and Mr J O Kilmartin of the U S Geological Survey, who had been assigned to make a topographic survey in the region about Lake Peten, arrived in Belize from Washington on February 14, 1923, with the instrumental equipment This consisted of magnetometer 12 and marine earth-inductor 7 to replace the instrument damaged by the accident in Colombia, theodolite 12 to be used as a reserve instrument, aneroid barometer and boiling-point apparatus for altitude determinations, two pocket chronometers and four watches for time control in case the radio outfit failed, and finally the radio equipment in four boxes of 316 pounds gross weight

A preliminary trial of the radio outfit at Belize was unsatisfactory, owing partly to the proximity of the electric plant and partly to the fact that the dry cells used as A battery were not up to full strength after the addition of water A second trial on the following day at the government radio station with the assistance of the native operator was entirely successful The entire 500 feet of antenna were put up, and no trouble was experienced in receiving on all wave-lengths, Arlington, Balboa, Pawtucket, and Nauen (Germany) were heard distinctly Late in the evening a concert broadcast from Bir-

mingham, Alabama, was picked up The operator interpreted the call signals for us, and gave us much valuable information as to the use and care of the instrument

Having satisfied ourselves that our equipment was in good order, and having provided supplies of food and camp necessities, we were ready for the long trip into the bush of northern Guatemala A flat-bottomed launch with a kerosene engine was chartered, and at 7 o'clock in the evening of Saturday, February 17, we shoved off After 12 hours we were out of the deep water and had come to a succession of rapids From Belize to El Cayo it is about 65 miles on a direct line, but is 180 miles by the continuously winding Belize River At the rapids the launch was warped by a line fastened to a tree 100 feet or more ahead and returned to the windlass on the launch, the crew working meanwhile in the water or with poles to keep the boat off the rocks At one place we tore a hole in the bottom, but quickly repaired it again by use of a piece of kerosene tin, one of the crew doing the work under water

After 49 hours on the river, during which it rained continuously, we landed at El Cayo Here the District Commissioner kindly provided quarters for us in the Government house, and a place to again try the radio equipment, which as before worked perfectly A magnetic and astronomical station was established close to that of 1909, and marked by a concrete post This was to be used as a base station, particularly in case the radio failed A delay in making the necessary astronomical observations, caused by the heavy rains, was utilized in securing mules, guides, and help Finally, on February 25, the party started for Flores, that little-known place across the Guatemala frontier We passed the customs without difficulty, thanks to the geniality of the newly appointed chief, at Plancha Piedra, on the boundary between the two countries It was here that an incident occurred that cast a gloom over the party From the 21 mules in the train, one of apparently docile temperament had been chosen to carry the bulky but precious radio instruments But appearances are deceitful in a mule No sooner had the box been placed on his back than he began to plunge and threw it over his head It landed on a corner, splitting the case All thought that to be the end of the receiver, remembering the operator's caution regarding its delicate mechanism Thereafter a man was assigned to that mule, leading him at all times, and clearing a passage for him through the tangled bush trails While on the trail all hands arose at 4 o'clock in the morning, so as to start at daybreak Camp was pitched again about 3 o'clock in the afternoon, while yet there was time for the mulemen to chop down bread-nut trees for their animals, and to hunt water-holes The leaves of the bread-nut tree are the only forage for mules in the jungle.

After six days on this comparatively open trail we reached Trapishe, on the mainland, across from Flores Native canoes brought us across the lake to the quaint, picturesque island town of some 3,000 inhabitants The party immediately registered with the military commander of the district, and then called on the governor of Peten to pay their respects and to secure permission to set up the radio outfit The governor did not recognize our credentials and ordered the set to be placed in his office until permission was secured from the central Government at Guatemala City Telegrams were immediately sent to the American Minister and to Mr P W Shufeldt, a friend of Dr Morley's at Guatemala City, to secure the instruments Two days passed and no answer came Mr Ricketson then outlined a plan for the work, in accordance with which, after magnetic observations were completed at Tayasal, the ruins on the mainland opposite Flores, I started for the ruins called Itsimte, accompanied by a guide Itsimte was reached the next morning, and I set a magnetic station in sight of the pyramid and the group of wonderfully carved stone monuments scattered throughout the bush Magnetic and astronomical observations were made at this point, using time as carried by the chronometer and watches from El Cayo, and I returned to Flores. Meanwhile,

permission had been secured from Guatemala City, and Mr Ricketson and Mr Kilmartin had set up the radio outfit in the Government telegraph office, with practically all the antennæ stretched out over the quartel, they could pick up no signals whatsoever, but noises in the receivers were terrific After working all day without success, and remembering the accident at Plancha Piedra, they concluded that the receiver had been seriously damaged and sent a cablegram via Guatemala City to Washington to that effect On my return to Flores, the apparatus was taken apart, and the condenser plates, which were out of alignment, were readjusted That night, to our great joy, the Arlington time signal was picked up distinctly, and a second cablegram conveying the good news was sent to Washington Thereafter, the time signals both from Balboa and Arlington were received distinctly with but little trouble from static

The night before we left, the people gave a dance in our honor, the music being supplied by a native marimba orchestra Everybody attended, and we were highly entertained The mulemen, guides, and help also enjoyed themselves so much that it was noon the next day before Mr Ricketson could find them, coming out of the effects, and start the expedition on its way

Ten more ruins were to be visited, so, leaving Mr Kilmartin to his assignment of making a topographical survey of the Lake Peten region, Mr Ricketson and I started for the eastern end of Lake Peten in a dugout canoe propelled by an Evinrude motor loaned by Dr Boburg of Flores, while the mules came around by land Camp was made at a clearing called Ixpop, and the Arlington and Balboa signals were easily obtained The ruins of Ixlu were about 5 miles away and in the thick jungle A clearing had to be made for astronomical observations In order to chop down one tree, it is necessary to chop down several others to let the first fall, on account of the tangle of vines of all descriptions After making astronomical observations, I returned to Remati, where Mr Ricketson had moved the camp in my absence In the dusk we inadvertently set up the radio instruments over a group of ant-hills, and receiving the signal that night was torture Our route was now through the actual jungle No villages were encountered, and we followed as nearly as possible the trails made by chicleros, or natives who go into the jungle to tap the sapoti tree for its chicle gum, from which chewing-gum is manufactured It was through these men that the existence of the ruins was first brought to the attention of the archeologists The chicleros work in the rainy season, and we met but a few belated stragglers We followed these trails until we came to a clearing near the ruins to be visited Near each clearing or camp site made by the chicleros there was always a water-hole, usually only a swamp, as the streams were rare in this section It was on account of this scarcity of water that no camps were made at the site of the ruins Man might be able to provide himself with enough for several days, but mules must have a large quantity every day or they will wander off by themselves in search of it The lack of water was our most serious problem In this region less than the usual amount of rain had fallen, and even the swamps were almost dry What water we did get was black, stagnant, and repulsive We boiled this mixture, made tea with it in an attempt to disguise the taste and odor, and it was thus made to suffice for the trip

Three days on the trail brought us to Tikal, where there are many pyramids, averaging 100 to 150 feet high, built of rubble masonry On top of each there is a limestone temple of heavy construction, the walls 3 or more feet thick, and the beams of heavy carved sapoti wood Considering their age and the climatic conditions, they are in a wonderful state of preservation The jungle growth has wrought havoc in the construction of the pyramids, tearing the masonry apart, but the temples in some cases are intact Observations here were made on the top of one of the pyramids at the base

of the temple. In the short time permitted at each site it was impossible to obtain bearings of the chief lines of the ruins as was desired To open lines of sight and clear the débris from the pyramids so as to find their exact form, at a place like Tikal, would be a season's work in itself Observations were made at Uolantun close by, and the party proceeded to Uaxactun Here we found the large aguada or water-hole bone-dry Water was then brought to this site in every available utensil and container, and we remained to work the station while the mules were sent back to the last water-hole, five hours' riding away, with directions to call for us the second day after Complete magnetic and astronomical observations were made, and radio time-signals received

Noachtun, our next objective, was three days' riding to the north We were doubtful about the wisdom of attempting the journey on account of the water question, and while debating it a chicle train met us coming from the north They reported that they had been without water for two days That settled it, and we began to retrace our steps to the south, intending to go by way of Nakum and Naranjo to El Cayo Three days' riding brought us to Nakum, and two more to Naranjo Complete observations for position were made at both places Leaving Naranjo, we lost the trail, and after ten hours' wandering, arrived in Benque Viejo, just east of the boundary-line of Guatemala, instead of at El Cayo Here we indulged in the luxury of a long-wanted bath in the river, and after a good night's rest under shelter we were ready to go out again, but the mulemen were not It was Easter, and they had to have their fiesta As a result, we lost two days waiting for them

Ucanal was easily reached by following a good trail along the Mopan River. The heat was intense, 105° F in the shade, melting the insulation from the wires. A canopy of palm leaves and canvas was placed over the instruments to protect them from the heat A complete set of magnetic and astronomical observations was obtained at this site A young jaguar, the only animal of the kind seen on the trip, came too near this camp and was shot by the guide Previously, we had seen plenty of monkeys of many kinds, wild hogs, various species of snakes, besides the deer and wild game in great variety which replenished our food-supply on many occasions

We returned to El Cayo, where check astronomical observations were made, and a new mule train hired for the last stage of the trip We loaded up with the last of our provisions and headed for Xmakabatun, where we arrived in five days and made a complete set of magnetic and astronomical observations My riding mule became sick and could not be used As a result, Mr Ricketson and I alternated riding and walking until we had eaten enough of the food to relieve a pack mule of its load and use it for riding Xultun is about 10 miles west of Xmakabatun, but it took three days by the roundabout trails to reach it Astronomical observations were made at Xultun, and three days more of riding brought us again to El Cayo, where observations for position were repeated on April 24 The following day we left El Cayo in a pitpan towed by a launch, and after a hot, uneventful trip arrived in Belize April 28, 70 days after our departure on February 17, 1923

Except for the omitted visit to Naachtun, and the more detailed survey of the alignment of the ruins, the expedition had accomplished what it set out to do The latitude and longitude of 11 sites of the ancient Maya Empire are now known. The determination of the longitude with desired accuracy was possible only by use of the radio On reaching a clearing, that outfit was set up first, and it was always a problem how to get enough antenna out Often this consumed a considerable time, but occasionally it was only a question of throwing a rope over a limb and hauling the wire up In some places we had about 300 feet out, but generally it was less, and in one case only 50 feet But withal the set worked admirably, and signals were received daily before and after astronomical observations. Only the station at Itsimte depends upon time carried by

watches, and these were corrected by signals received the following day at Flores. By means of comparisons made twice daily between the various time-pieces carried, it is believed the desired accuracy of one-half minute of arc has been obtained. The value of radio in surveys of this kind is unquestioned. The set used in this work functioned satisfactorily at all times. Static was always bad, but interference from this cause could be so reduced that every signal was heard without interruption. Probably no set ever received rougher usage or was subject to such handling and climatic conditions as this one. Yet it functioned perfectly throughout the trip. The same three vacuum tubes were used throughout, and the batteries were still good. The only drawback was its bulk, the complete set making two and one-half mule loads. It is hoped that a more compact and equally serviceable outfit will be developed, and that a form of loop antenna can be substituted for the long wire in places where it is impossible to stretch a wire suitably. Exposed wires should have a covering designed to withstand the high temperatures often encountered in the tropics. The same is true of the composition used in the cells of the dry batteries.

TABLE 43

No	Name	Date	Lat North	Long East
		1923	° ′	° ′
1	*Belize, A*, British Honduras	Feb 8–10	17 28.4	271 49
2	Belize, *B*, British Honduras	Feb 12	17 29.4	271 48
3	*El Cayo*, British Honduras	Feb 22, Apr 8	17 10.2	270 55.9
4	*Flores* (Tayasal), Guatemala	Mar 6, 10	16 56.0	270 06.5
5	Itsimte, Guatemala	Mar 8	16 56.0	269 48.6
6	Ixlu,[a] Guatemala	Mar 13	16 58.6	270 18.3
7	Tikal,[a] Guatemala	Mar 18	17 13.3	270 21.5
8	Uolantun,[a] Guatemala	Mar 19	17 10.8	270 23.2
9	Uaxactun, Guatemala	Mar 22–23	17 23.8	270 21.6
10	Nakum,[a] Guatemala	Mar 26	17 10.3	270 33.7
11	Naranjo,[a] Guatemala	Mar 29	17 07.5	270 44.3
12	Ucanal, Guatemala	Apr 5	16 58.8	270 38.2
13	Xmakabatun, Guatemala	Apr 15	17 31.2	270 45.8
14	Xultun,[a] Guatemala	Apr 20	17 30.5	270 35.5

[a] At these stations no magnetic observations were made.

The greatest care was taken in transporting the instruments. The radio receiver was placed alone on a mule and received the attention of a man at all times, the magnetometer was placed in a large kyack, with the blankets and hammocks to protect it from bumps against trees and possible falls. The trails were tough and very often had to be opened with axes and machetes before the instrument cases could pass. Handling 18 mules in the jungle is in itself quite a problem. They would constantly wander off the trails for a coveted blade of grass, and with almost human intelligence would wedge themselves between two trees close together, then kick and struggle until free from their load, scattering it throughout the bush.

Personal discomforts were many. The difficulty of obtaining refreshing drinking-water has already been described. Immediately on entering the bush we were covered with the garapates or ticks. Bottle flies and other insects constantly assaulted us, until our bodies were completely discolored with red and blue bites from which we could get no relief. As soon as we had adjusted ourselves in camp, we would dive into our hammocks and under the mosquito net to keep out these pests and escape the fleas left by the chicleros. Owing to the lack of water, baths and shaving were out of the question, until we struck the Mopan River, a branch of the Belize River. At each site it was necessary to ride from one to three hours from the *jato* or camp to a place at the ruins suitably cleared to permit solar observations, forenoon, noon, and afternoon.

Magnetic elements were determined at five sites, thus giving a fair distribution over the area covered Observations for altitude above sea-level by means of aneroid and boiling-point apparatus were made at each site visited The distance covered was approximately 430 miles.

At Belize I was later met by Mr Kilmartin, who had just finished his assignment All the excess equipment was returned to Washington with him, and after all computations were brought to date, I left Belize on May 15 on the steamship *Gansfjord* with magnetometer 27 and chronometer 50,107 to complete my Central American assignment

Table 43 shows the stations at which magnetic observations were made, and those at which only the geographic positions were determined, with dates of occupation and geographic position, for further details, see Descriptions of Stations and Table of Results

W. A LOVE, ON MAGNETIC WORK IN CENTRAL AMERICA, MAY TO NOVEMBER 1923

On the completion of my work in northern Guatemala in cooperation with the expedition for the study of mid-American archæology, I resumed my program of reoccupying magnetic stations under my original instructions of June 10, 1922 It was my intention to work from Belize, British Honduras, down the Caribbean coast, then to cross overland, reoccupy stations accessible from the Pacific side, and go thence into Mexico. Difficulties in securing suitable transportation made it impossible to carry out this plan entirely.

The magnetometer and earth inductor used in northern Guatemala had been replaced by magnetometer-inductor 27 at Belize. By going first to Puerto Barrios, and thence by a small launch to Puerto Cortez, then by using another launch and an auxiliary power sailboat, I managed to reach Truxillo, Honduras, on May 26 Travel along this coast of Central America is rough and uncomfortable, transportation is meager, and to reach ports along the north coast of Honduras one has to use native launches and sailboats with all the attendant inconveniences and close association with a distasteful assortment of passengers The only communication with Cape Gracias á Dios and thence down the Mosquito Coast of Nicaragua was by the infrequent and irregular chance sailboats On the strength of hearsay only, I waited a week in Truxillo for a labor-carrying sailboat to put in from the Cape It did arrive, and the captain said that within another week he would return, but in the meantime he was going to Bay of Islands I went with him and made a station at Oak Ridge, Roatan Island, but on returning to Truxillo the captain informed me that he could not go to the Cape I next arranged to charter a boat, but had to wait for the owner to find a captain who knew the coast Neither boat nor captain ever turned up A lumber schooner with cross-ties for the United Fruit Company arrived, and its return seemed assured In the interval, opportunity was courteously furnished by the United Fruit Company to go to Casuna, about 100 miles east of Truxillo, where they were building a railway, and after establishing a station, I returned and went aboard the lumber schooner While waiting for it to sail, a Hamburg-American steamer arrived, and I learned that it would sail in a few hours for Costa Rica The steamer had been chartered by the Costa Rica Red Cross to return about 100 Costa Rican laborers who had been stranded here in Honduras as I was. The uncertainty of the time required to reach Cape Gracias á Dios, and the more serious uncertainty of securing transportation beyond that point, led me to decide to secure transportation on the steamer, if possible. I went out to the steamer in a launch kindly provided by the fruit company, and arranged for a passage to Port Limon, Costa Rica, where I arrived on June 30, the entire month having been spent in the exasperating effort to make the journey from Truxillo I learned later that the lumber schooner was three weeks in reaching Cape Gracias á Dios, that the captain had

died on the voyage, and that the crew were without food or water for several days; so Fortune was not altogether unkind to me.

With little delay after making the necessary observations at Port Limon, I embarked on an auxiliary power schooner for Bluefields, Nicaragua, and thence by the same schooner I proceeded farther north to Prinzapolca. The rainy season had set in, and the voyage was exceedingly rough and the weather squally. The sand-bar had closed the entrance to the Prinzapolca River and we entered the Walpasicsa River, five miles farther north. By ascending this river 30 miles, we met the Prinzapolca, and then sailed 30 miles down that stream to Prinzapolca, a detour of 60 miles. After a stay of half a day, we returned as we came. From the mouth of the Walpasicsa we went northward to the Wawa River, and after crossing a dangerous bar, ascended that stream 20 miles to a mahogany camp called Wawa Saw-Mill, arriving at 4 p. m. on July 15. Only incomplete observations were possible here on account of the short stay, as we left the following morning shortly after daybreak. After reoccupying the station of 1909 at Bluefields Bluff on July 19, I again took passage on a small sloop for Greytown, which we entered on July 22, after an exciting passage over the bar with the sea full of hungry-looking sharks.

During the half day waiting for the boat up the river to Lake Nicaragua, I established a station at Greytown. The boat was a flat-bottomed, shallow-draft boat propelled by a gasoline engine. Travel was slow, due to the swift current and numerous stretches of rapids. The boat was crowded and one slept in his seat during the night, there being no room to stretch out. On the third day we reached San Carlos, and left shortly for Granada on the lake steamer without time for any observations, arriving on July 27. Observations were also made at Corinto and at Managua, where the work was greatly facilitated by the officers of the U. S. Marine Corps who were stationed there. From Corinto passage was taken directly for La Libertad, Salvador, from which place a 25-mile automobile ride brought me to San Salvador. I went to La Union by rail, chartered a launch to Amapala, the Pacific port of entry of Honduras, on August 17, and after crossing to San Lorenzo by launch, I reached Tegucigalpa by truck over a good road 84 miles long. Returning to Amapala, I took passage on the Mexican steamer *Chiapas* by way of Corinto, to San Juan, Guatemala, arriving September 1.

From September 8 to 12, I made special magnetic observations at Guatemala City in connection with the investigation of the total solar eclipse on September 10. After the computations of that work had been completed and forwarded to Washington, I went by rail to Mulna, and there hired an automobile to take me to Quesaltenango. The road was in wretched condition, and the trip was made in a downpour of rain. Observations were made at the latter place, where the altitude is about 8,000 feet and the climate quite cold. The return to Mulna was an interesting experience. The trip was made in the dawn of early morning, while the country roundabout was brightly lighted by the fires from the volcano Santa Maria, then in eruption. The wreck of the regular ship for the south compelled me to proceed to San José by rail. After observations I caught the tourist ship *Venezuela* direct to Panama, where the station of the *Carnegie* party of 1921 was reoccupied.

I took advantage of my visit to Panama to receive special treatment at the hospital for the malaria that had been troubling me during the past few months. A few days spent there practically rid me of that trouble, and on October 22 I left Panama on the small steamer *David* for Pedrigal, from which port the town of David was reached by rail. Returning to the canal, I went to San José, Costa Rica, by way of Port Limon. The occupation of this station completed the list of available stations in Central America, and an unfortunate accident to the instrument made it impossible to go on with the Mexican work before extensive repairs were made. With the instrument set up for the

latitude observations on a hill outside the city, a sudden gust caught up the hat from the head of a native who was assisting me with the luggage, and in attempting to recover it, he ran into the tripod and upset the instrument On making a report of the affair by cable to Washington, I was authorized to return with the instrument to the Office before going on with the Mexican work, and accordingly I left San José on November 16, and reported in Washington on November 26, 1923.

Table 44 shows the stations at which magnetic observations were made, with geographic positions and dates of occupations, for additional details, see Descriptions of Stations and Table of Results

TABLE 44

No	Name	Date	Lat North	Long East
		1923	° ′	° ′
1	*Puerto Barrios*, Guatemala	May 18–19	15 44 2	271 25
2	*Puerto Cortez*, Honduras	May 23	15 51 3	272 03
3	*Truxillo, A* Honduras	May 28–29	15 55 8	274 02
4	Truxillo, *B*, Honduras	May 30	15 55 8	274 02
5	Oak Ridge, Honduras	June 7	16 23 8	273 38
6	*Casuna* (= Port Burchard), Honduras	June 24	15 53 1	274 50
7	Port Limon, Costa Rica	July 2– 3	9 58 0	276 55
8	*Uvita Island*, Costa Rica	July 5	10 00 1	276 58
9	Bluefields, Nicaragua	July 9–10	11 59 5	276 16
10	*Prinzapolca*, Nicaragua	July 13	13 24 7	276 25
11	Wawa Saw-Mill, Nicaragua	July 15–16	14 06	276 26
12	*Bluefields Bluff*, Nicaragua	July 19	12 00 1	276 20
13	*Greytown*, Nicaragua	July 22	10 54 9	276 18
14	*Granada*, Nicaragua	July 28	11 56 1	274 03
15	*Managua, B*, Nicaragua	Aug 1– 2	12 09 4	273 44
16	Managua, *A*, Nicaragua	Aug 3	12 09 9	273 44
17	*Corinto*, Nicaragua	Aug 6	12 27 2	272 49
18	*San Salvador, A*, Salvador	Aug 11–12	13 41 4	270 49
19	San Salvador, *B*, Salvador	Aug 12	13 41 4	270 49
20	*Amapala*, Salvador	Aug 17	13 17 7	272 21
21	*Tegucigalpa, A*, Honduras	Aug 22	14 04 9	272 48
22	Tegucigalpa, *B*, Honduras	Aug 23–24	14 06 5	272 47
23	*Guatemala, A*, Guatemala	Sep 8–14	14 38 0	269 30
24	Guatemala, *B*, Guatemala	Sep 15	14 38 0	269 30
25	Quesaltenango, Guatemala	Sep 25	14 51 4	268 31
26	*San José*, Guatemala	Sep 28–29	13 55 5	269 13
27	*Old Panama, A*, Panama	Oct 10–11	9 00 2	280 31
28	Old Panama, *B*, Panama	Oct 11–13	9 00 2	280 31
29	*David, A*, Panama	Oct 23–27	8 26 3	277 35
30	David, *B*, Panama	Oct 26	8 25 3	277 34
31	*San José, B*, Costa Rica	Nov 12–14	9 56 6	275 56
32	San José, *C*, Costa Rica	Nov 15	9 56 6	275 56

SUMMARY

In all eighty-six stations were occupied, not counting the few occupied jointly with Mr Green in the Bahamas Of these, ten were occupied while in Mr Green's party and six were astronomical stations only for determining the geographic positions in Peten, Guatemala

Of the eighty stations, seven were class I stations with eight auxiliary stations, thirteen class II stations with nine auxiliary stations, seventeen class III stations, and twenty-six class IV stations Special eclipse observations were carried out at Guatemala City September 8 to 12 inclusive, under special instructions

The total distance covered from time of leaving Washington until returning thereto was 17,633 miles, of which 2,617 miles was travel while in Mr Green's party and 2,300 miles was travel from the field Of the total distance covered, 4,543 miles were by railroad, 10,398 miles by steamer, 1,020 miles by sailboat, 716 miles by launch, 435 miles by automobile, and 521 miles by mule, 430 of the last being in the Peten trip

Excluding the work done on the assignment in Peten for geographic position only, and the travel to and from the field, the average distance per station was 185 miles Of the mileage in the field, a good deal was due to doubling back on my original track caused by transportation difficulties in Central America

The total cost of the trip from the time I parted with Mr Green in Havana to my return to Washington was $3,768 03, not including the expenses of the Peten trip

Counting only the cost in the field of the magnetic stations occupied while alone, the average cost per station for 85 stations was about $50, while if the principal station and its auxiliary in the same vicinity are counted as but one, the cost is about $68 per station.

Throughout the trip every possible courtesy and assistance was given me, particularly by the American consular and diplomatic services, and also by many government officials and private individuals and concerns, particular mention being made of the United Fruit Company, the Tropical Oil Company, the Carib Oil Company, and port authorities of the Canal

W. C Parkinson, on Magnetic Work in Northern Africa and Arabia, December 1921 to March 1922

Acting upon instructions dated August 20, 1921, I handed over charge of the Watheroo Magnetic Observatory, Western Australia, to Dr. G. R. Wait on December 1, 1921, and left Watheroo the following day, sailing from Fremantle westward by steamer *Mantua* on December 9, 1921. The instrumental equipment carried consisted of magnetometer-inductor 27, with tripods, observing-tent, pocket chronometer, watches, and the usual accessories.

My instructions included the reoccupation of the C I W magnetic stations at Jidda and Tor in the Red Sea From inquiries made at Bombay it was learned that it would be more expeditious, and therefore cheaper, instead of transshipping to a trading-vessel at Aden, as was first intended, to continue to Suez by the *Mantua* and return to the Red Sea ports by the Khedival mail steamer I arrived at Port Said on January 2, and, while waiting for the Red Sea steamer, proceeded to Helwan Observatory, near Cairo, where, with Mr H Knox-Shaw, the superintendent, a series of comparisons with the Helwan magnetic standards was carried out between January 7 and 11 Leaving Helwan on January 14, I proceeded by rail to Suez, where the C. I W. secular-variation station was reoccupied on January 17 to 19.

On January 21, I left Suez by the Khedival mail steamer *Mansourah*, and Jidda, the pilgrim port for Mecca, was reached on January 25 Upon landing, a visit was first paid to the acting British vice-consul, Mr. Grafty Smith, who at once offered me all the assistance in his power. Before any steps could be taken with regard to observational work, it was necessary to obtain the permission of His Majesty King Hussein of the Hedjaz, who was, at the time, in Mecca The permission was sought through Rushti Bey, the prime minister, who telephoned to His Majesty, and, luckily finding the King in an amiable mood, received a reply which said, in effect, that he felt highly honored by my presence and that every facility was to be accorded me in the furtherance of my important mission Mr. J C Dilley, manager of the Jidda branch of Messrs. Gellatly, Hankey and Company, offered me hospitality for the duration of my stay, and this being gratefully accepted, I was free to bring ashore my equipment and undertake observational work while the *Mansourah* called at Port Sudan and Suakin and returned to Jidda. After completing the observations, I planted a permanent marking-stone to facilitate reoccupations in the future. It may be remarked here that in countries such as the coastal districts of Arabia or Egypt, where wood for fuel is scarce, it is not advisable

to mark the station with a wooden peg in the hope that it will remain there until some future reoccupation of the station A stone pillar offers the best chance of permanency, but permission from some authority to erect the stone should always be obtained beforehand, if possible in writing

The *Mansourah* returned to Jidda on February 1, and I left by her the same day to return northward King Hussein had caused orders to be telegraphed along the coast that, wherever I wished to land to make observations, I was to be given every assistance At Yambo, where I called upon Amir Ali, heir apparent to King Hussein, at El Wedj, where I was accorded a military reception, and at Tor, the Egyptian quarantine station on Sinai Peninsula, I was able to make observations during brief stops of the steamer The work at these three stations was greatly facilitated by the assistance of the wireless operator of the *Mansourah,* Mr C. Sharps, to whom I gratefully acknowledge my obligation

From Suez I proceeded direct to Alexandria by train, arriving there the evening of February 6 My time in Alexandria was so taken up with passport matters and in arrangements for a passage to Tunisia that I found it impossible to do any observational work there. My intention had been to take a small coasting steamer from Alexandria to Tripoli, and there to connect with another vessel on to Sfax or Tunis, but the Italian Consul at Alexandria, in view of the unrest prevailing in Tripolitania at that time, refused to visé my passport without written authority from Tripoli. As the time involved in getting this authority, even had it been forthcoming, would have been considerable, I decided to omit the visit to Tripolitania and endeavor to proceed direct to Tunisia

There was no direct connection between Alexandria and Tunis by sea, and I was advised to ship to Malta, where I should be able to get a steamer to some Tunisian port. Luckily, after some inquiry, I found a British steamer sailing for Malta on February 11, and I secured a passage by this vessel, arriving in Malta on February 15 By what appeared at the time to be a lucky chance, a small vessel was, after an extensive mechanical overhaul, scheduled to leave Malta that day for Tunis, and she was confidently expected by the owner-captain to arrive in Tunis, 300 miles distant, in something less than 22 hours I booked my passage and was all prepared, with the other passengers, for departure, when we were informed that the engines would require a little more tuning up and the sailing was postponed until the next day On the following day we left Valetta Harbor at about 4 p. m , and two hours later put into Gozo Harbor, 17 miles away, with a broken steam valve We left Gozo Harbor at about noon on February 17, and after buffeting a very strong head sea for four hours, the Captain, acting in deference to the wishes of those of the passengers who were still able to express themselves, turned the ship once more into Gozo Harbor and remained there until 7^h the next morning, when the storm had to a certain extent abated At 10 a m on Sunday, February 19, we finally arrived at Tunis.

On February 24 I traveled to Sfax by rail, returning to Tunis the following day, and on March 1, I left Tunis for Touggourt, an oasis village at the extreme southern limit of the Algerian railroad system. En route it was found necessary to break the journey for three days at Constantine, and the enforced spending of a portion of a day at Biskra, both in going to and coming from Touggourt, enabled me to get a glimpse of this interesting little town which caters to those tourists who desire to get a first-hand idea of Saharan desert "atmosphere" without depriving themselves of the comforts of a European hotel I left Touggourt on March 9, arriving in Algiers on March 12.

After visiting the Bouzareah Observatory, Algiers, and arranging for some cooperative observation there, I went to Oran for observations and returned to Algiers the same evening. On March 19, I observed diurnal variation of magnetic declination at the

magnetic station in the grounds of the Bouzareah Observatory, and on the two following days I made a series of magnetic observations at the "Moureaux" station nearby, while M Baldet, of the Bouzareah Observatory, observed at the observatory station I left Algiers in the evening of March 23 by steamer for Marseilles, arriving there in the morning of March 25, and reached Barcelona, Spain, the following morning Owing, however, to a blunder on the part of a railroad porter at Marseilles, my heavy baggage had been sent to another destination, and a day was consumed in returning to the French frontier station, where it was held until the customs formalities had been complied with

Table 45 gives the stations occupied, with dates of occupation and geographic positions, for additional details, see Descriptions of Stations and Table of Results.

TABLE 45

No	Name	Date	Lat North	Long East
		1922	° ′	° ′
1	*Helwan Observatory*, Egypt	Jan 7–11	29 51 6	31 20
2	*Suez*, Egypt	Jan 17–19	29 57 9	32 33
3	*Jidda, A*, Arabia	Jan 30	21 28 3	39 11
4	Jidda, *B*, Arabia	Jan 27–28	21 29 8	39 11
5	Yambo, Arabia	Feb 2	24 04 7	38 03
6	El Wedj, Arabia	Feb 3– 4	26 13 0	36 28
7	*Tor*, Egypt	Feb 5	28 14 4	33 36
8	*Tunis*, Tunisia	Feb 22	36 45 5	10 07
9	*Sfax*, Tunisia	Feb 26	34 43 6	10 45
10	*Touggourt*, Algerian Sahara	Mar 7– 8	33 07 8	6 05
11	*Oran*, Algeria	Mar 17	35 44 7	359 24
12	*Algiers, M*, Algeria	Mar 20–21	36 48 1	3 02

W C PARKINSON, ON COMPARISON OBSERVATIONS AT CERTAIN EUROPEAN MAGNETIC OBSERVATORIES, MARCH TO SEPTEMBER 1922

On my arrival at Barcelona, after the completion of the reoccupations for secular variation in northern Africa, I went immediately to the Observatorio del Ebro at Tortosa, Spain This was the first of a series of magnetic observatories with whose standards I was to compare magnetometer-inductor 27, which in turn had been compared with the standards at Washington and at Watheroo, and would be finally compared at Washington at the close of the expedition On the afternoon of my arrival, I discussed with Father Rodés the program of comparisons to be made. This program was carried out between March 30 and April 2, and on April 4 I left Tortosa, greatly impressed with the efficiency and zeal of the staff of the observatory, the good condition of their equipment, and the prompt, but at the same time careful, manner in which the resulting data are made available for publication

My next objective was the observatory at San Fernando, near Cadiz, and in order to reach it I had to travel by a rather circuitous route through Valencia and Madrid, changing trains frequently en route. I arrived at Cadiz on April 6, and the same afternoon took my equipment out to the observatory at San Fernando, about 12 miles distant Comparison observations were made at San Fernando between April 7 and 12 Magnetically, San Fernando is a very disturbed station, owing to the close proximity of electric-car lines Partly, I suppose, owing to this disturbance, and because the nautical-astronomical work of the observatory is of more practical importance, the magnetic work takes a secondary place With the equipment used, and under the prevailing conditions, high observational accuracy is not to be expected

The route from Cadiz to Coimbra, Portugal, via Seville and Badajos, involved changing of trains seven times during the 36 hours of travel, but notwithstanding, I arrived at Coimbra on April 15 with my baggage intact. The same afternoon I took

my equipment out to the Coimbra Observatory and conferred with Dr. Carvalho In spite of an inferior instrumental equipment, I found the magnetic work there on a very satisfactory footing. Although the electric-car lines are not more than 400 meters distant at the nearest point, yet there is hardly any appreciable effect from them when making observations at the magnetic station in the observatory grounds Comparison observations were made at Coimbra between April 17 and 21, and I left for Paris the following day by the Lisbon-Paris express.

Acting on supplementary instructions, I interrupted my observatory comparisons at this point in order to attend the meetings at Rome of the International Geodetic and Geophysical Union, May 2 to 10, and to assist the Director, Dr L A. Bauer, in his duties as Secretary of the Section of Terrestrial Magnetism and Electricity. This visit also provided an opportunity for making comparisons with the instruments of the Italian Magnetic Survey, in cooperation with Professor L Pallazo, at Terracina, Italy On the return to Paris, comparisons were made at Val Joyeux on May 25 and 26, and going thence to Berlin, I made a series of observations on June 1 to 3 on pier 5 of the Potsdam Observatory, the station used by Mr Pearson in 1910 After a short leave of absence, comparisons were made at De Bilt, near Utrecht, in Holland, and at Rude Skov, Denmark To reach Sodankyla, where the next comparisons were to be made, I went first to Stockholm, and thence by steamer to Abo, Finland, at which place I arrived on the morning of July 9 Then followed a railroad journey of about 700 miles to Rovaniemi, the capital of Finnish Lapland, near the head of the Gulf of Bothnia Rovaniemi is the northernmost point of the Finnish railroad system, and the magnetic observatory of Sodankyla lies about 85 miles farther north by road Twice a week, when weather permits, a mail automobile runs from Rovaniemi to Ivalo, a settlement in Lapland nearly 200 miles distant, passing close to the Sodankyla Observatory I found on my arrival at Rovaniemi that there was an automobile scheduled to start that evening at 10 o'clock. At this latitude, of course, there is no darkness in July. Accordingly I booked my passage, and the start was made punctually at the time advertised There were fifteen passengers besides the driver and a postal official, and at the rear of the auto there was piled a great quantity of mail, parcels, and general merchandise I had some difficulty at the outset in convincing the driver that the magnetometer could not be thrown in with the general cargo, and only decided the matter by carrying it on my knees for the whole journey. It was well, from the instrumental point of view, that I did, for though the roads were in very bad order, the driver kept up a consistently high speed

I was set down from the auto in the neighborhood of the Sodankyla Observatory at about 3 o'clock in the morning on July 12 Walking down to the River Kemi from the road, I could see the observatory on the farther bank, but there was no means of getting across The letter announcing the date of my arrival had not been received, and it was not until nearly four hours later that I was able to make my presence known and was rowed across to the observatory. After some needed rest, comparisons with the Sodankyla magnetic standards were begun, being completed the following day, July 13 The staff of the observatory, Mr. E. Hyyrylainen, his wife, and one aid, deserve great credit for their operation of the instruments, both magnetic and meteorological, under rather trying climatic conditions at such an isolated post. Owing to the unreliability of the communication, I deemed it advisable at the first opportunity after the completion of the comparisons, to take the post auto back to the rail-head, and I therefore left Sodankyla at midnight on July 13, arriving at Rovaniemi the next morning and at Helsingfors in the evening of July 15 Here it was my privilege to meet Professor Melander, Director of the Finnish Meteorological Bureau and chairman of the committee of the Finnish Academy of Science under whose auspices the Sodankyla Magnetic

Observatory is operated I arrived again at Copenhagen on July 20, completing the comparisons at Rude Skov Observatory the same day, and reached London late in the following evening

Beginning on August 1, comparisons were made successively at the Royal Observatory, Greenwich, at the Eskdalemuir Observatory, Scotland, at the Royal Observatory of Belgium at Uccle, and at the Kew Observatory

At Teddington, during the early hours of the morning of September 23, in conjunction with Mr F E Smith, F. R S , Director of Scientific Research at the British Admiralty, I made a comparison of values of horizontal intensity obtained with magnetometer-inductor 27 and the Schuster-Smith electromagnetometer

On September 30, I sailed from Liverpool for New York, arrived in Washington on October 9, and reported to the Office the following day

Table 46 shows the observatories at which comparisons were made, with geographic positions and dates of the observations To the list of European observatories have been added, for the sake of completeness, the Watheroo comparison at the beginning of the expedition, the comparison at Helwan, Egypt, during the African work, and the comparison at Washington, which closed the series Further details will be given in a special report on Observatory Standards in a future volume of these Researches

TABLE 46

No	Name	Date	Latitude	Long East
		1922	° ′	° ′
1	*Watheroo Observatory*, Watheroo, Western Australia		30 18 9 S	115 53
2	*Helwan Observatory*, Helwan, Egypt	Jan 7–11	29 51 6 N	31 20
3	Ebro Observatory, Tortosa, Spain	Mar 30–Apr 2	40 19 2 N	0 30
4	Marine Observatory, San Fernando, Spain	Apr 7–12	36 27 7 N	353 48
5	Meteorological Observatory, Coimbra, Portugal	Apr 17–21	40 12 4 N	351 35
6	*Terracina, Italy*	May 16–18	41 17 0 N	13 14
7	Val Joyeux Observatory, Villepreux, France	May 25–26	48 49 4 N	2 01
8	*Potsdam Observatory*, Berlin, Germany	June 1– 3	52 23 N	13 04
9	De Bilt Observatory, Utrecht, Holland	June 30, July 1– 3	52 06 5 N	5 11
10	Rude Skov Observatory, Copenhagen, Denmark	July 5– 6,20	55 50 6 N	12 27
11	Sodankyla Observatory, Sodankyla, Finland	July 12–13	67 22 1 N	26 39
12	*Royal Observatory*, Greenwich, England	Aug 1– 3	51 28 6 N	0 00
13	*Eskdalemuir Observatory*, Eskdalemuir, Scotland	Aug 13–16	55 18 9 N	356 48
14	Royal Observatory, Uccle (Brussels), Belgium	Aug 21–24	50 47 9 N	4 21
15	*Kew Observatory*, Richmond, Surrey, England	Sep 19–25	51 28 1 N	359 41
16	National Physical Laboratory, Teddington, England	Sep 22–23	51 26 N	359 40
17	*Standardizing Magnetic Observatory*, Washington, D C , U S A		38 57 4 N	282 56

J E. SANDERS, JR , ON MAGNETIC WORK IN THE AZORES, MADEIRAS, CANARIES, AND MOROCCO, MAY TO AUGUST 1925

In accordance with the instructions of the Assistant Director dated April 20, 1925, I left New York on May 14, and arrived at Ponta Delgada, San Miguel Island, Azores, on May 23, 1925 My instrumental outfit consisted of magnetometer-inductor 26, two half-second chronometers, watches, and accessories I was met aboard the ship at Ponta Delgada by Colonel F A. Chaves, Director of the Meteorological Service of the Azores In conference with him a plan for instrumental comparisons and reoccupations of selected stations in the islands was outlined It was decided to make use of pillars previously erected by Colonel Chaves, from which known azimuths had already been determined In accordance with that plan, complete comparisons were made at Ponta Delgada, and reoccupations made of Meteorological Service stations on Terceira, Flores, and Fayal Islands, the party returning to Ponta Delgada June 18. There are but two

boats each month between the islands, and these usually stop one day at each port, but the stay in port was much shorter on this trip Only hasty observations at each station are possible under such conditions unless one is willing to spend two weeks at each island It was possible to make observations for declination on this trip only because well-marked stations were available where marks of known azimuth could be used. Astronomical observations were quite impossible because of cloudiness at this season In addition to the clouds at higher altitudes, each day a very heavy fog covers the islands, often making it impossible to see a mark as close as 30 meters I was told that from August to November the conditions in this respect in the Azores are much better.

The native tongue is Portuguese, though one can find many on each island who are able to speak English While illiteracy is common, the people are very shrewd when it comes to bargaining with the foreign traveler None of the islands have docking facilities in the harbors for the larger vessels, and it is necessary to go ashore in launches or rowboats On these small boats each of the crew will attempt to collect for the passage, while the proper person to receive payment is the head boatman ashore Another difficulty which the traveler must meet is the existence of two money systems, the insular or "weak" money and the Portuguese or "strong" money The difference between the two systems, using the same denominations, is about 20 per cent Natives are quick to take advantage of the traveler's ignorance or confusion, to the latter's disadvantage It is best to keep all money in the strong exchange, as the corresponding value in the weak can be readily calculated

Throughout the work in the Azores, most courteous and generous assistance was received from Colonel Chaves and his assistants at the various island stations He accompanied me on the trip among the islands and our work was greatly expedited by the provision of a boat, for which he had made arrangement in advance, waiting to take us ashore at each stop

From the Azores I arrived at Funchal, Madeira, on June 22, reoccupied the two former C I W stations, and left for Morocco on July 4 Here the military authorities and other officials were most courteous in the assistance given and showed great interest in the work of the Department On July 4, I was fortunate in being able to secure passage direct to Tangier, Morocco, where I arrived at noon on July 6, though rough weather delayed landing until evening Magnetic observations at Tangier were made on July 7 and a start was made by autobus for Larache on the following day Owing to mechanical troubles, small cars had to be substituted for the bus when but a short way out, and as these could not accommodate both passengers and luggage, I returned to Tangier and made the trip the following day Building operations made impossible the exact recovery of the station of 1912 at Larache, where two stations were occupied on July 10 The following day I left for Rabat Again finding it impossible to carry all my baggage, I left the trunk to follow the next day, but was obliged to return for it after waiting until the 14th

The conditions in Morocco at this time made entrance into the French zone somewhat difficult The thoughtfulness of Colonel Chaves in notifying the Chief of the Meteorological Service in advance of my coming, furnished an introduction that proved quite helpful After the holidays of July 13 and 14, the requisite official pass was obtained, and the C I W. station of 1912 was reoccupied After completing work at Rabat, I went to Casablanca, and then directly to Marakech, occupying a class I station, and returning to Mogador on July 26 At Casablanca I found that a steamer was about to leave for the Canary Islands and that the next was 20 days later I therefore abbreviated the work at that station, and sailed for the Canaries on July 31.

Throughout the work in Morocco, all travel was by automobile There are excellent roads from Tangier to Marakech and Mogador There is also a railroad paralleling

the highway, but it can not compete with the excellent bus lines which operate daily between all points In spite of the Riffian difficulties, the coast towns are carrying on an enormous export trade, Casablanca, according to statistics for 1924, ranking seventh among the ports of France and her possessions

The first stop in the Canaries was at Santa Cruz, La Palma Island, not hitherto visited by observers of the Department A new station was established there on August 3. The old station at Santa Cruz, Tenerife, was reoccupied August 4 and 5, and that at Las Palmas, Gran Canaria, on August 7 My instructions called for stations in the Cape Verde Islands and a reoccupation at Rio de Oro on the west coast of Africa No feasible way was found of reaching the Cape Verde Islands from the Canary Islands There was one boat a month to Rio de Oro, but the length of the stay there was insufficient for the desired observations, and absence of opportunity for observations en route either way made it impracticable to make that trip

On August 22, I left the Canary Islands for Freetown, Sierra Leone, and arrived there on August 28

Table 47 is a list of the stations occupied, with dates of occupations and geographic positions, for additional details, see Descriptions of Stations and Table of Results

TABLE 47

No	Name [a]	Date	Lat North		Long East	
		1925	°	′	°	′
1	Ponta Delgada, *A*	May 24–26, June 6	37	44 8	334	20
2	Ponta Delgada, *Observatory*	June 2–10	37	46 4	334	21
3	Ponta Delgada, *C*	June 12	37	47 2	334	14
4	Angra	June 14, 18	38	38 8	332	47
5	Horta	June 15	38	31 6	331	22
6	Santa Cruz	June 16	39	26 8	328	52
7	*Funchal, A*	June 23, 24	32	38 0	343	05
8	*Funchal, C, D*	June 25	32	37 2	343	04
9	Funchal, *B*	June 27, 30	32	37 8	343	05
10	*Tangier, A*	July 7	35	47 8	354	08
11	*Larache, B, C*	July 10	35	12 5	353	50
12	*Rabat*	July 16, 17	34	01 5	353	10
13	Marakech, *A, B*	July 20–24	31	37 0	352	00
14	*Mogador*	July 27, 28	31	31 9	350	16
15	*Casablanca*	July 30	33	34 2	352	23
16	Santa Cruz, La Palma Island	Aug 3	28	41 4	342	16
17	*Santa Cruz,* Tenerife Island	Aug 4, 5	28	28 1	343	45
18	*Las Palmas, A, B*	Aug 8–17	28	07 7	344	33

[a] The stations are in the following countries or island groups Nos 1 to 6, Azores Islands, Nos 7 to 9, Madeira Islands, Nos 10 to 15, Morocco, Nos 16 to 18, Canary Islands

J E SANDERS, JR, ON MAGNETIC WORK IN SIERRA LEONE AND FRENCH WEST AFRICA, AUGUST TO DECEMBER 1925

From the Canary Islands I went directly to Freetown, Sierra Leone, arriving there on August 28 Unfortunately, September is one of the months of maximum rainfall, and this made the task of securing magnetic observations very slow and difficult During the month the stations at Freetown, Bo, and Moyamba were reoccupied On September 22 I went to Conakry, French Guinea Here also rain fell constantly Magnetic observations were made, but astronomical observations were impossible I decided, therefore, to return to Dakar, Senegal, where conditions were not so bad At Dakar, slight showers followed by occasional tornadoes late in the afternoon, signified that the rainy season there was about over Two weeks were spent in making observations and preparing for a trip into the interior I took advantage of my presence at the capital

of French West Africa to secure from the Governor-General, M. Card, a letter of introduction to the lieutenant-governors and administrators throughout French West Africa, which afterwards proved to be most helpful. The services of Mr Clarence Macy, American consul, were of great value in presenting my requests before the government officials, as well as in arranging the details of my work I was also fortunate in meeting Mr Constant Southworth, an economist from Washington, who also desired to make a trip into the interior in the course of his investigations of the economic conditions of the African colonies. It was to our mutual advantage to make the trip together and, accordingly, we set out by rail from Dakar on October 13, for Kayes on the upper Senegal River

Our first destination was Tambacounda, the mid-point of the Dakar-Kayes railway The train arrived at that station about 3 o'clock in the morning, while all members of our party were asleep We were wakened by the noise of the engine in leaving the station, and were able hurriedly to leave the train with only hand baggage Other parts of the equipment had been carried on It was not until October 19, therefore, that we were able to finish the work and proceed to Kayes

At Kayes there was no hotel, and we spent the first night, from the time of our arrival about midnight, in the railway station The next day the French deputy very graciously gave us quarters in one of the government houses After the conclusion of our work, arrangements had to be made for our descent of the Senegal River As the last trip for the season of the river steamer, the *Bani*, had been made, it was necessary to go by native sailboat or "chaland." There were many of these leaving Kayes, but an owner willing to take white passengers was not so easily found. The space necessary for two whites, according to the black skipper, was enough for six or seven black passengers, hence he wanted a good price for our passage. On October 29, we left Kayes for Matam, French Soudan, on a chaland which carried as fellow-passengers about 30 blacks with their many goats, dogs, monkeys, and sundry other pets

On November 3, the chaland left us at Matam, and proceeded on down the river The administrator gave us the only quarters available, a very small one-room house which proved to be only large enough for our baggage This was not a great hardship, for eating and sleeping under the trees was pleasanter, on account of the heat Because of the myriads of mosquitoes it was necessary to eat early and to retire under our nets before dark On November 8, we took passage on another chaland for Podor, and this leg of the journey was one of lasting memory Throughout the trip we encountered contrary winds, and our little sailboat was obliged to tack continually in the narrow river, thereby doubling the distance traveled Of greater annoyance, however, was the smallness of the boat, which made it impossible to escape intimate contact with the countless cockroaches with which the chaland was infested, at night they fairly covered the walls of the boat and sleep was disturbed by their crawling over our bodies and their nibbling at our toes After one week in this craft we arrived, on November 15, at our next destination, and left without regret the dirty little boat for the clean quarters given us by the French administrator.

On the three following days observations were made at Podor repeat and auxiliary stations, and preparations were all made for leaving on the *Bani* on Sunday morning As the steamer was not to leave until 7 a m. we slept ashore, and arrived at the wharf with all baggage an hour before that time, only to find that the steamer had left in the night It would have been little trouble for the commissaire to have told us the change in plans, but he did not, and we were apparently doomed to another trip on a native chaland On November 27 we secured passage on a large sailboat belonging to one of the commercial houses The winds this time were most favorable, so that we arrived

at St Louis, at the mouth of the Senegal River, on the morning of December 1, concluding a trip of 1,000 kilometers on the Senegal River

Throughout the trip I had been accompanied by Mr. Southworth, whose companionship was greatly appreciated, and to whose valuable services as interpreter I am much indebted As cook-boy I had taken a Calaba from Nigeria who rendered fair service There were few vegetables to be had, so that chickens, eggs, and rice constituted the chief items of food, and these were often hard to get Frequently the natives would refuse to sell to white men On approaching several of the villages they retired to their huts, taking with them their chickens and goats, and declined to come out as long as we remained in the village Notwithstanding the great discomfort of some parts of the journey, there was partial compensation in the opportunity afforded of observing the living habits of the black people as they were exhibited in the close quarters aboard the chaland

Everywhere on the journey most courteous attention and every possible assistance were extended by the French authorities Besides invaluable assistance given by his excellency the Governor-General and by the American Consul, already mentioned, special mention should be made of the helpful services so freely given by M Joseph Court, Secretaire General du Senegal, St Louis, and M Jouve, Fonctionnaire at Kayes

From St Louis I went at once by way of Dakar to Conakry and completed the work which had been interrupted by the incessant rain in September Plans were here made for undertaking a more extended trip, first to the headwaters of the Niger, thence down that river by way of Timbuktu to Lagos, Nigeria After completing the observations and spending Christmas day with friends at Conakry, I was ready on December 29 to take the weekly train for Kankan Just before the train pulled out I received the season's greetings cabled by the Department, and my mail, which Mr. Smith, of Elder Dempster Company, was so kind as to send to the train Thus at the close of the year I was ready for the extended inland expedition on which I was to reoccupy stations of Berky and Sawyer along the course of the Niger River

Table 48 shows the stations occupied, with dates of occupation and geographic positions, for additional details, see Descriptions of Stations and Table of Results

TABLE 48

No	Name [a]	Date	Lat North	Long East
		1925	° ′	° ′
1	*Freetown*	Sep 4, 5	8 29 7	346 44
2	*Bo*	Sep 10,11	7 57 8	348 11
3	*Moyamba*	Sep 14	8 09 2	347 32
4	*Dakar, A, B*	Oct 6–11 Dec 9,11	14 42 0	342 34
5	Tambacounda	Oct 18	13 47 4	346 22
6	*Kayes, A, B*	Oct 21–24	14 26 8 [b]	348 34
7	*Matam, A, B*	Nov 4–6	15 39 3 [b]	346 46
8	*Podor, A, B*	Nov 16–18	16 39 4 [b]	345 03
9	*St Louis, A, B*	Dec 3, 4	16 02 8 [b]	343 31

[a] The stations are in the following countries Nos 1 to 3, Sierra Leone, Nos 4 to 9, French West Africa

[b] Mean of two stations

J. E SANDERS, JR, ON MAGNETIC WORK IN FRENCH WEST AFRICA, FROM CONAKRY TO COTONOU, BY WAY OF NIGER RIVER AND DAHOMEY, DECEMBER 1925 TO APRIL 1926

Sailing from Dakar, I arrived at Conakry December 18, 1925, and completed there the magnetic observations which had been prevented during September by the continuous rains. I spent Christmas Day with friends, and December 29 took the weekly train for

Kankan On arriving there after an intermediate stop for observations at Mamou, it was found that, because of the low stage of the water, no steamers were going down to Bamako, French Soudan, and it would be necessary to go overland by automobile This overland route lies between Kouroussa and Bamako, a distance of about 400 kilometers, and the tariff for this trip, often made in a single day, is 2,500 francs, about equal to the fare by rail to Conakry, by sea to Dakar, and thence to Bamako by rail through Senegal Fortunately, the American Mission at Kankan wass ending a camionette to Bamako to get other members of the Mission for the annual convocation to be held at Kankan, and passage was secured upon it While at Kankan an option was secured on a wooden chaland belonging to the Mission for use in descending the Niger

Returning at once to Kouroussa from Kankan, a magnetic station was occupied in time to leave January 7 for Bamako, where we arrived the following evening Interesting features of this trip were the stop at Yirikiri, where one of the few saw-mills in French West Africa is located, and where fresh grapefruit and strawberries were to be obtained We spent the night at Sigiri at the American Mission, and attended one of their religious services It was held in the mission chapel and well attended, though twice interrupted by the general exit of all, first because of a native dance with tom-toms at the front of the chapel, and then by a shower of stones on the metal roof overhead (said to be of common occurrence)

At Bamako, final arrangements for the long descent of the Niger River had to be made. The navigation company advised either buying or renting a chaland for the entire trip But there was none for sale at Bamako, and owners of chalands for rent would not permit their boats to go below the rapids of Labbezanga The chaland for which provisional arrangements had been made at Kankan with the American Mission was sent for and, while waiting for its arrival, I went to Koulikoro and made magnetic observations, returning to Bamako January 20 Here I met Mr Leland Hall, of Harvard University, who had just returned from a two-months' stay at Timbuktu and who was anxious to make the trip down the Niger An arrangement to make the journey together was fortunate for me, for in addition to being a most amiable companion, Mr Hall spoke French easily and rendered valuable service as interpreter The chaland arrived from Kankan on the last day of the month, and as the water was too low to pass the rapids between Bamako and Koulikoro, it was necessary to ship it over the railroad We arrived February 5 at Koulikoro and again met the Commandant of the Circle of Bamako, who was there for the day He had given valuable assistance in the earlier preparations and now put me under additional obligation in arrangements for unloading the chaland and for necessary repairs These were considerable, as exposure to the Sun on the rail trip from Bamako had opened the seams and made a complete recalking imperative. This is usually a ten-day job for the black man, but with two black men working day and night under constant supervision, the chaland was launched at 2 p m, Sunday, February 7, and at $5^h 15^m$ Mr Hall and I, with Momo, our cook boy, and 14 black punters or laptots, went aboard and the descent was begun.

At Segou, where there is a large cotton-experiment station in charge of an American agricultural expert, we made an exact reoccupation of the C I. W. magnetic station of 1913. At Mopti, at the junction of the Bani River with the Niger, where the extensive rice-growing plantations are protected by dikes extending many miles along the river, we were not so fortunate, as, because of the growth of the villages, the former station could not be recovered, and two new ones were established Beyond Mopti, the greenness of the fields began to give way to barren, sandy soil, and it was evident that we were approaching the sand-dunes of the desert. The first night out of Mopti we had our first bad luck. We had been traveling both night and day and often ran upon sand-banks and other obscured obstructions About 9 o'clock on the evening of February 19 the

boat ran upon a hidden log The laptots pushed off and continued down stream We had gone to bed, but were wakened a little later with about 10 inches of water in the bottom of the boat Upon investigation we found that a large hole had been made in the bow The rest of the night was spent ashore, where we were serenaded from time to time by the hyenas in the bush near at hand Fortunately, extra tar and oakum had been placed aboard, so that by noon we had repaired the damage and were on our way again

February 24 was spent in reoccupying the magnetic station at Niafunké We continued the next morning on the last leg of our journey to Timbuktu, where we arrived on the last day of the month, three weeks to the hour from the time we left Koulikoro In the dry season one must leave the river at Kabara and make the 10 remaining kilometers to Timbuktu by horse, we were able, however, to ascend the canal with the chaland to our destination Timbuktu, although still very interesting, is no longer the mysterious city of days gone by No longer one of the great Arab teaching centers and no longer under the rule of the Pasha of Morocco, Timbuktu is now on the decline The hospitality, however, with which we had been met at other posts was not lacking here We were given rooms in the governor's palace and every courtesy for our personal comfort and facility for the prosecution of our work by the French officials We left this interesting old city with regret March 12 to continue our trip down the Niger At 11 o'clock we arrived at Kabara by horse, having sent the chaland on ahead, and an hour later the 14 black laptots poled us out into the stream and took up their paddles From Timbuktu on the water is very deep and paddles replaced the poles by which we descended the shallower waters above

On the evening of March 20 we arrived at Burem, the first French post after leaving Timbuktu We were glad of the opportunity of discharging the Timbuktu laptots, who were getting restless on account of the length of the trip Observations were made here while Mr Hall got the new crew of laptots ready to go, so that at 1 o'clock we resumed the descent We found it advisable to again change laptots as soon as possible, and so stopped at Gao long enough to take on a new crew for the trip to Ansongo, where we arrived on the afternoon of March 26

Observations were made on the following morning while Mr Hall assembled a new crew, with which we left in the afternoon for Niamey Between Ansongo and Tillaberry we changed crews three times The first crew accompanied us to the head of the rapids of Labbezanga, where we took on the second, who knew the river well from the village They carried us only through the rapids, one chute of 100 yards being the most difficult The fact that we passed the rapids safely, while an iron chaland just behind us hit the rocks several times proved that we were fortunate in securing the Labbezanga men to take us through The Administrator at Gao had informed us that the village of Labbezanga was a little hostile to the French at the time, having refused to serve the Governor-General a short time before However, when we arrived at Labbezanga we sent the chief of our crew over to see the chief of the village with a few kola nuts as a gift, and asked for the laptots to put us through the rapids Either the kola nuts or a reputation for treating our men justly, or both, brought the men in a short time, apparently anxious to serve us, and doubtless they would have been glad to continue had we not already arranged by telegram from Tillaberry for the crew to be sent up the river to meet us just below the rapids

We arrived at Niamey, Niger Territory, April 2, and were cordially received by the French Administrator Owing to changes in laying out the village and the construction of new houses, the former station was impracticable, and two new ones were established After engaging new laptots, we set out on the afternoon of April 4 for Gaya, at which place our journey by river would terminate. Fortunately, the Government was

in need of a chaland and arrangements were readily made at Niamey for the sale of our boat, to be delivered to the Government officials upon reaching Gaya At Gaya, Mr Hall, who was eager after ten months in French Soudan to return to France, left immediately for Cotonou It had been just two months that we had traveled together from Koulikoro, and it was with regret that I bade him good-bye after our most enjoyable journey together After carrying out the magnetic program at Gaya, I left by the weekly autobus, April 16, for Cotonou. Intermediate stops for magnetic observations were made at Savé and Parakou Cotonou was reached April 22

At Kandi in Dahomey the first rain for several months was encountered. The quick descent from the sandy, dry regions to the hot and humid coast at Cotonou made the change in the climate most noticeable, and to this I attribute the return of mild attacks of fever The work at Cotonou was completed and I left for Lagos, Nigeria, May 4 Throughout the journey in French West Africa, every possible courtesy, private and official, was extended, and every lone post entertained us most hospitably.

TABLE 49

No	Name [a]	Date	Lat North	Long East
		1925–26	° ′	° ′
1	*Conakry, A, B*	Dec 19–23	9 30 9	346 16
2	*Mamou, A, B*	Dec 30–Jan 1	10 22 9	347 55
3	Kouroussa	Jan 6	10 38 8	350 06
4	*Koulikoro, A, B*	Jan 13–18	12 52 5	352 27
5	*Segou, A, B*	Feb 10–12	13 26 7	353 43
6	*Mopti, A, B*	Feb 17–19	14 29 8	355 47
7	*Niafunké,*	Feb 24	15 55 6	356 00
8	*Timbuktu, A, B*	Mar 4–8	16 46 3	356 58
9	*Bourem*	Mar 22	16 56 7	359 37
10	*Ansongo*	Mar 27	15 39 7	0 30
11	*Niamey, A, B*	Apr 2– 4	13 30 5	2 07
12	*Gaya, A, B*	Apr 9–14	11 52 7	3 31
13	*Parakou*	Apr 18	9 21 2	2 40
14	*Savé*	Apr 21	8 02 1	2 31
15	*Cotonou, A, B*	Apr 27–29	6 21 5	2 25

[a] All stations are in French West Africa Where positions of stations *A* and *B* differ, that for *A* is taken

There are hotels and buffets along the railroads and the Niger River as far as Koulikoro, and traveling is a simple matter Below Koulikoro from August to January, the flood season, there is a weekly steamer as far as Timbuktu But if one is to go below the latter point it is better to buy or rent a boat at Koulikoro for the entire trip If purchased, there is usually a ready sale for it at the end of the journey in Niger Territory. A chaland 12 meters long and about 3 5 meters wide was found ample for two white men to live aboard It was quite large enough for two X-type camp-beds to be placed in the forward half at night, and for two deck-chairs and a folding table in the day Baggage, equipment, and supplies were kept aft and still left room for the cook-boy to perform his duties One needs the usual camping outfit, except the tent. European goods and foods can be purchased at all the posts, but it is advisable to purchase these as near the coast as possible, as the cost of transportation to the interior makes such goods come high During the fall and winter months one may obtain fresh vegetables from the splendid gardens at all the French posts Chickens, eggs, fish, and fresh milk are usually obtainable at the native villages along the river A rifle and shot-gun (12-bore), while not necessary, may be carried with advantage, as the number of ducks along the river is astonishing These are found delicious at first, though after having eaten a few one senses a feeling of disgust for all fowl, however, it keeps up the spirit of the laptots to

add the game to their chop Deer and antelope are plentiful and delicious It is always best to wire ahead for laptots or other required labor, and it is usual to find the request fulfilled upon arrival Above Timbuktu an interpreter is not essential, but below that post one finds few natives speaking French, and an interpreter becomes a necessity

From the time of leaving Dakar in the middle of December until arrival at Cotonou, Dahomey, at the end of the following April, 25 stations in 15 localities were occupied, making the average time for each locality about 9 days and the field cost about $32 Of about 3,000 miles of travel, 500 were by sea, about 700 by railroad, and the same by automobile, the remainder being by river chaland Thus the average travel for each locality occupied was about 200 miles.

Table 49 shows the stations occupied, with geographic positions and dates of occupation, for additional details, see Table of Results and Descriptions of Stations

J E SANDERS, JR , ON MAGNETIC WORK IN GUINEA COAST AND NIGERIA, MAY TO DECEMBER 1926

Mr Sanders continued in the field after the work described in the preceding reports through the remainder of the year 1926 After reaching Lagos, Nigeria, he began a series of reoccupations westward along the coast of Upper Guinea, but as the rainy season had set in his progress was greatly hindered Leaving Lagos May 30, he occupied stations in 3 localities in Gold Coast Colony, followed by 3 in Ivory Coast, an inland station at Bouaké being included among the latter Delays because of incessant rains and occasional attacks of fever, as well as the inevitable delays in securing transportation, retarded his progress so that it was August 8 when he arrived at Cape Palmas, Liberia Known local disturbance in the vicinity of Cape Palmas required the establishment of a group of stations within a comparatively small area there Continued unfavorable weather and infrequent communication made it advisable to omit the proposed visit to Sino and Monrovia, and he sailed again for Lagos, September 11 Prevented by continual rains from making further observations, he decided to go at once to the head-

TABLE 50

No	Name[a]	Date	Lat North		Long East	
		1926	°	′	°	′
1	*Lagos, A, B, C*	May 16–26	6	26 9	3	24
2	*Accra, A, B, C*	June 4–11	5	32 5	359	49
3	*Kumasi, A, B*	June 17–22	6	41 0	358	26
4	*Sekondi, 1926*	June 26	4	56 4	358	18
5	*Grand Bassam, A, B*	July 12–13, Aug 4	5	11 8	356	15
6	*Bouaké, A, B*	July 21–22	7	42	355	00
7	*Abidjan*	July 26	5	19	355	58
8	*Cuttington, A, B*	Aug 14–21	4	23 3	352	19
9	*Cape Palmas, A, B, C*	Aug 25–Sep 9	4	21 6	352	16
10	*Harper*	Sep 1, 2	4	22 2	352	16
11	*Garoua, A, B*	Oct 21–25	9	17 6	13	24
12	*Yola, A, B*[b]	Oct 30, Nov 1	9	16 3	12	28
13	*Amar*	Nov 10–11	8	40 9	10	23
14	*Ibi, A, B*	Nov 13–15	8	10 8	9	44
15	*Lokoja, A, B*	Nov 23–25	7	48 3	6	44
16	*Jebba, A, B*	Dec 4–6	9	07 7	4	49
17	*Zaria, A, B*	Dec 10–11	11	06 8	7	43
18	*Kano, A, B*	Dec 21–27	12	01 0	8	33

[a] The stations are located in the following countries Nos 1, 12 to 18, Nigeria, Nos 2 to 4, Gold Coast Colony, Nos 5 to 7, Ivory Coast, French West Africa, Nos 8 to 10, Liberia, No 11, Cameroun, Where positions of stations *A* and *B* differ, that for *A* is taken

[b] Yola is a proximate reoccupation of Jimeta, 1914

waters of the Benue River and work down that stream while the stage of the water was sufficient for navigation Mr Sanders accordi gly left for Burutu September 26, took the river steamer directly to Yola, and made the short overland journey thence to Garoua, Cameroun, on horseback He arrived at Garoua, October 17, and after the completion of the desired observations returned to Yola, and began the descent of the Benue River, November 3. Stops were made for observations at Amar (November 10 and 11), at Ibi (November 12 to 15), and at Lokoja (November 20 to 26) From Lokoja, where the Benue River joins the Niger River, he ascended the latter as far as Baro by river steamer, and completed the journey to Jebba by railroad, going by way of Minna. Again by means of the railway he went northward to Zaria, where observations were made, and thence to Kano, near the northern limits of the colony. Here it was found impracticable to go farther northward and plans were made to start about January 1, 1927, on an overland trip to Fort Lamy on Lake Tchad, and from there to work southward to the Congo River

The stations occupied are given in Table 50, together with dates of occupation and geographic positions; for further details, see Table of Results and Descriptions of Stations.

J. SHEARER, ON MAGNETIC WORK IN WESTERN AUSTRALIA, OCTOBER TO NOVEMBER 1921

Acting under instruction of the Director, I was detached from the Watheroo Observatory for a month's field work, at first with Mr F Brown, and later alone, reoccupying secular-variation stations in Western Australia. After arriving in Perth on the morning of October 29 and completing official business, I proceeded to Cottesloe and assisted Mr Brown in the reoccupation of the C I W station there. At Bunbury, the next station visited, evidences of local disturbance were present, so that a new station had to be chosen, and the usual monthly diurnal-variation observations were made jointly

TABLE 51

No	Name	Date	Lat South			Long East	
		1921	°	′		°	′
1	*Cottesloe, A*	Oct 30	31	59	1	115	45
2	*Bunbury, A*	Oct 31–Nov 3	33	20	1	115	37
3	Bunbury, *B*	Nov 2–3	33	20	6	115	38
4	*Katanning*	Nov 5	33	41	3	117	34
5	*Narrogin*	Nov 7	32	55	8	117	10
6	*Northam*	Nov 10	31	38	6	116	40
7	*Southern Cross*	Nov 11–12	31	13	6	119	20
8	*Coolgardie*	Nov 14–16	30	57	1	121	10
9	*Leonora*	Nov 19	28	51	0	121	18

with Mr Brown Complete observations were made at Narrogin on November 7, after which Mr Brown left for Perth, and I proceeded alone to Northam Leaving Northam, I turned eastward and visited successively Southern Cross, Coolgardie, and Leonora, completing work at the last place on November 21 Because of the necessity of returning to Watheroo within the month, and because of the infrequent train service, I was obliged to omit two points which were designated for secular-variation observations, Norseman and Laverton. Leaving Leonora on November 22, I arrived at Perth the following day and reported back at the Observatory at Watheroo on Saturday, the 26th

All the travel had been by rail, the total distance being about 1,700 miles, or the distance in the field about 1,450 miles, an average of about 180 miles per station. The

field cost per station was about $25 It is a pleasure to acknowledge the valuable assistance rendered by the Government Astronomer, H B. Curlewis, in the matter of obtaining time signals

Table 51 shows the stations occupied, with dates and geographic positions, for additional details, see Descriptions of Stations and Table of Results

SYNOPSES OF ADDITIONAL MAGNETIC SURVEYS, 1921 TO 1926

Carnegie Shore Stations—A complete report of the work done on Cruise VI has been published in Volume V of this series, and that portion accomplished up to the end of 1920 at shore stations has also been published in Volume IV. The *Carnegie* left Washington in October 1919, and after cruising in the Atlantic, the Indian, and the Pacific oceans, arrived at San Francisco, California, February 19, 1921, where she remained until March 28 undergoing repairs She then put in successively at Honolulu, Hawaiian Islands, at Apia, Samoa Islands, and at Balboa, Canal Zone

Table 52 shows the stations occupied at each of these ports during the year 1921, with the dates of occupation and geographic positions The magnetic results and the details regarding the shore stations are repeated in this volume for the sake of completeness and will be found under Table of Results and Descriptions of Stations

TABLE 52

No	Name	Date	Latitude	Long East
		1921	° ′	° ′
1	San Francisco, *Fort Scott*,[a] *A*, *B*	Feb 26–Mar 17	37 48 7 N	237 31
2	*San Rafael*	Mar 18	37 58 6 N	237 27
3	*Honolulu* [b]	Apr 15–25	21 19 2 N	201 56
4	*Apia* [c]	July 1–20	13 48 4 S	188 14
5	*Colon, Sweetwater*	Oct 12	9 21 3 N	280 03
6	Old Panama, *A*	Oct 17	9 00 2 N	280 31

[a] At San Francisco the station at Fort Scott was substituted for that at Goat Island, which was no longer available

[b] At Honolulu, observations were made at Sisal, Honolulu Magnetic Observatory *Pier A*, and stations *A* and *B*

[c] At Apia, observations were made at the Apia Observatory, *North Pier*, *S E Pier*, and *West Pier*, and at stations *A* and *B*

Père E Colin—In the general survey of Madagascar, Mr Brown found it impossible to visit Tamatave on the east coast on account of conditions requiring a quarantine against that place when he reached that vicinity In order to fill in the gap in the line of stations along that coast caused by this omission, Père E Colin, late director of the Tananarive Observatory, volunteered to make the observations when opportunity presented itself. This he was able to do, and he observed at Fenerive also on the same occasion, and kindly supplied the Department with his results The dates of these observations and the geographic positions are given in Table 53. Additional details are given in the Descriptions of Stations and the Table of Results

TABLE 53

No	Name	Date	Lat South	Long East
		1921	° ′	° ′
1	Tamatave	Sep 15–29	18 09 6	49 24
2	Fenerive	Sep 21	17 22 4	49 23

G. F. Dodwell and A. L. Kennedy—The Department has been fortunate in the continued cooperation of the Government Astronomer, G. F Dodwell, of South Australia,

and the Assistant Astronomer, A L. Kennedy. Mr Dodwell secured some data on a trip to the western boundary of the state, and Mr Kennedy made observations during the eclipse of September 1922, near the northeast corner of South Australia, and carried out extensive comparison observations with Mr Coleman at Port Augusta

The names of the stations, with dates of occupation and geographic positions, are given in Table 54, additional details may be found in Table of Results and Descriptions of Stations

TABLE 54

No	Name [a]	Date	Lat South	Long East
			° ′	° ′
1	Cook	Apr 14–15, 1921	30 37	130 25
2	Deakin	May 2– 3, 1921	30 46 0	128 58
3	Lyndhurst Siding	June 6, 1922	30 17 3	138 21
4	*Marree*	June 7,1922, May 9,1923	29 39 4	138 03
5	*Cordillo Downs*	Sep 15–22, 1922	26 42 9	140 38
6	Mt Lofty, *A*	Feb 26–Mar 9, 1923	34 58 5	138 42
7	*Adelaide, Botanical Park*	Mar 9, 1923	34 54 9	138 37
8	*Port Augusta, A, B*	May 1–5, 1923	32 29 7	137 46
9	*Farina*	May 9–12, 1923	30 04 4	138 17
10	*Peterborough*	May 19, Oct 2–3, 1923	32 56 9	138 51
11	*Burra*	Oct 30–Nov 1, 1923	33 41 0	138 56
12	*Yorketown*	June 20–21, 1924	35 01 2	137 36
13	*Edithburgh*	June 23–24, 1924	35 05 9	137 46
14	*Port Victor*	Nov 29–Dec 1, 1924	35 33 7	138 35

[a] Stations Nos 1 and 2 were occupied by Mr Dodwell, the remainder by Mr Kennedy, C A Madorn and L M Waterford, of the observatory staff, assisted

Eclipse Parties—Wherever field parties have been working near the path of totality of a solar eclipse, the observers have carried out the program of special observations so far as possible with the field equipment During the Australian eclipse of September 20, 1922, D G Coleman occupied a station in its path at Coongoola, Queensland, Australia, and the cooperating party of A L Kennedy made observations at Cordillo Downs, in northeastern South Australia On the same occasion C M. Little made continuous observations at Huancayo, Peru, from 20^h5 on September 20, to 3^h0 September 21, local time, the Observatory not then being in operation

At the time of the eclipse of September 10, 1923, W A Love was in Guatemala, and carried out the three-day program, while a special party, consisting of J P Ault and H F Johnston, went to Point Loma, California, with apparatus for both magnetic and atmospheric-electric observations Cooperation was also arranged by Captain Ault with observers at Mount Wilson

A party was organized for observations during the eclipse of January 10, 1925, under Captain J P Ault, who chose a station at Greenport, Long Island, New York For this occasion a special temporary observatory was erected and magnetograph instruments installed These were in charge of R H Goddard, assisted by J E Sanders, jr, while atmospheric-electric recording instruments were established in a second temporary building, in charge of C B Goldsmith

Liberian Boundary Survey—Arrangements were made with L C Daves, the chief engineer of the Liberian Boundary Survey, to make magnetic observations during the progress of the work of that expedition To that end, he and his chief assistant, C T Bussell, were given instruction in the use of instruments which were loaned them, in November and December 1923 The observations, the records for which have been received, were made chiefly by Mr Daves, who was assisted by Mr Bussell, and by C G. Cheeks, who received instruction from Mr Daves

Table 55 shows the stations, with dates of occupation and geographic positions, additional details are given under Table of Results and Descriptions of Stations

TABLE 55

No	Name	Date	Lat North	Long East
			° ′	° ′
1	Monrovia (Bushrod Island)	June 23-24, 1923	6 21 5	349 12
2	Robert Port (Cape Mount)	Sep 3- 4, 1923	6 45 3	348 38
3	Sanoye	July 4–21, 1924	6 58 6	350 01
4	Naama	Aug 14–18, 1924	7 16	350 37
5	Sino	Dec 11–16, 1924	5 00	350 55

J E Sanders, Jr, and A H Kampe—In April 1925, before undertaking field assignments, observers J E Sanders, Jr, and A H Kampe carried out observations at a few of the United States Coast and Geodetic Survey stations in southeastern United States, under the direction of H W Fisk The purpose of the expedition was to obtain desired secular- and diurnal-variation data in the region visited while securing for the observers the necessary experience in field practice, with especial reference to methods for controlling diurnal-variation observations made with field instruments

The names of the stations, with dates of occupation and geographic positions, are given in Table 56, additional details will be found in Table of Results and Descriptions of Stations

TABLE 56

No	Name	Date	Lat North	Long East
		1925	° ′	° ′
1	Florence, South Carolina	Apr 20	34 12 7	280 11
2	Whiteville, *A*, *B*, North Carolina	Apr 21	34 21 3	281 18
3	*Waycross*, *A*, *B*, Georgia	Apr 22–25	31 14 1	277 39
4	Bunnell, *A*, *B*, Florida	Apr 27–29	29 27 6	278 44
5	Jacksonville, *A*, *B*, Florida	Apr 30	30 22 2	278 20
6	Dalton, *A*, *B*, Georgia	May 2	34 46 3	275 02
7	Bristol, Virginia	May 4, 5	36 36 2	277 49

United States Navy—The officials of the Hydrographic Office of the United States Navy have arranged to extend their program of magnetic observations in connection with chart surveys of shore-lines beyond the boundaries of this country The Department has been glad to cooperate in two of these expeditions, one by the U S S *Niagara* to the northern coast of Venezuela, on which the magnetic work was done by Lieutenant Jennings Courts, and the second by the U S S *Nokomis* to the northern coast of Cuba, the magnetic work being in charge of Ensign S E Latimer.

MacMillan Baffin Island Expedition—The Department was fortunate in being able to assign one of its observers, R H. Goddard, to the expedition organized by Dr Donald B MacMillan for exploration and scientific investigations in Baffin Island G Dawson Howell, Jr, of Dr MacMillan's staff, was also trained at the Department in the methods of magnetic field-observations and use of other scientific instruments Dr MacMillan's auxiliary power schooner *Bowdoin*, of about 63 tons, was outfitted for the expedition and carried, besides the necessary supplies, the essential materials for constructing a temporary magnetic observatory in which the magnetograph instruments were operated The *Bowdoin*, with its crew numbering seven men in all, left Wiscasset, Maine, on July 16, 1921, and made stops at Sydney, Nova Scotia, Bonne Bay, Newfoundland, Battle Harbor, Labrador, Ashe Inlet, Baffin Island, and at two stations in Fox

Channel before reaching winter-quarters The objective of the Expedition was the vicinity of Fury and Hecla Straits Ice conditions prevented penetrating so far and the *Bowdoin* finally anchored for the winter in latitude 64° 24′ north and longitude 77° 52′ west, in a natural harbor on the southwest of Baffin Island and named Bowdoin Harbor by Dr MacMillan

The observatory was set up at this place and continuous photographic registrations of the usual three magnetic elements and the electric potential-gradient were made from about November 1 to about the middle of June 1922, with the necessary control observations in the interval Observations were also made of the tides, polar lights, and meteorological conditions

During the time of the December full moon, Mr Howell made a sledge trip to Cape Dorset, about 50 miles to the east, and in January traveled northward about 100 miles to the vicinity of Cape Dorchester A second trip was made by Mr Howell in this region in April, but penetrating inland some 40 miles farther Early in May he undertook a sledge journey eastward along the southern coast of Baffin Island to Lake Harbor, and thence 110 miles farther and return by canoe He was then able to join the Hudson's Bay Company's ship *Bayeskimo* to the north coast of Baffin Island, making observations at Albert Harbor and Pond's Inlet Mr Howell, having been detached from the *Bowdoin* for this special work, returned to St John's, Newfoundland, on the *Bayeskimo*, making two stops in Labrador on the way

On the return voyage of the *Bowdoin* stops were made at a few points along the coast, and these were utilized as far as possible by Mr Goddard for obtaining observations

Table 57 shows the stations occupied by the party aboard the *Bowdoin*, with dates and geographic positions

TABLE 57

No	Name	Date	Lat North		Long East	
		1921	°	′	°	′
1	*Sydney*, Nova Scotia	July 25	46	09	299	48
2	Bonne Bay, Newfoundland	July 29	49	34	302	02
3	*Battle Harbor, D*	Aug 1–2	52	16	304	25
4	*Battle Harbor, C*	Aug 3	52	16	304	25
5	Ashe Inlet, *A*	Aug 17	62	33	289	25
6	Fox Channel	Aug 22	65	52	279	46
7	Queen's Cape	Sep 3	64	42	281	08
8	Bowdoin Harbor	Nov to June 1922	64	24	282	08
		1922				
9	*Cape Dorset, A, B*	Aug 5	64	14	283	26
10	*Port Burwell, B*	Aug 13	60	25	295	08
11	Nain	Aug 20	56	33	298	19
12	*Battle Harbor, D*	Aug 30	52	16	304	25

Table 58 shows the stations occupied by Mr Howell when on expeditions away from the *Bowdoin*, with dates and geographic positions

Maud Expedition, 1918–1921—Cooperative arrangements were made with Captain Roald Amundsen to secure magnetic observations during this expedition in the Arctic north of Russia and Siberia The *Maud*, with a personnel of ten men, left Vardo, Norway, July 18, 1918, and sailed along the north coast until she had passed Cape Chelyuskin, the most northerly point of Siberia Here progress was stopped by the ice on September 13, and preparations were made for passing the winter about 25 miles east of the cape During the stay at this place some sledge journeys were made about Chelyuskin Peninsula, and late in 1919 the vessel, after much difficulty, was made free from the ice and proceeded eastward The attempt to penetrate the drift-ice here and move with it across the polar

sea was unsuccessful, and quarters for the second winter, 1919–20, were established at Ayon Island During this winter Dr H U Sverdrup made some excursions inland, traveling and living with the nomadic Chukchi, a number of whom were found living at Ayon at the time of the vessel's arrival The *Maud* left Ayon Island on July 6, 1920, and arrived at Nome, Alaska, on July 27, 1920 After a short stay, the *Maud* again left for the Arctic, to make a third attempt to pierce the drifting ice-fields, but was again frustrated by the unusually large quantity of ice, in struggling with which the propeller shaft was broken, and a third winter was passed, this time at Cape Serdze Kamen, about 70 miles west of Bering Strait During this winter, sledge journeys by Dr Sverdrup and Mr Wisting to Holy Cross Bay on the south and to Pitlekai on the north of Chukotsk Peninsula The *Maud* left her winter-quarters on July 1 and arrived at Seattle, Washington, on August 31, 1921

TABLE 58

No	Name	Date	Lat North		Long East	
		1921	°	′	°	′
1	Baffin Island No 1	Dec 12	64	25 [a]	282	30 [a]
2	Baffin Island No 2	Dec 15	64	18 [a]	282	55 [a]
3	Cape Dorset	Dec 18	64	14	283	26
		1922				
4	Nauwatta	Jan 1	65	12 [a]	282	24 [a]
5	Baffin Island No 3 (Noovooknok)	Jan 5	65	24	282	27
6	Baffin Island No 4	Jan 10	65	06 [a]	282	18 [a]
7	Baffin Island No 5	Apr 4	65	24	283	19
8	Baffin Island No 6	Apr 8	65	20	284	06
9	Baffin Island No 7	May 11	64	19	284	50
10	Amadjuak	May 18	64	02	287	05
11	Baffin Island No 8 (Etenilk)	May 22	63	26	287	47
12	Baffin Island No 9 (Sabooyak)	May 24	63	04	288	45
13	Lake Harbor	June 4, 16	62	51	290	04
14	Baffin Island No 10	June 18	62	25	290	56
15	Baffin Island No 11	June 21	62	09	292	01
16	Baffin Island No 12	June 28–29	61	55	293	17
17	Albert Harbor	Sep 5	72	42	282	26
18	Ponds Inlet	Sep 6	72	41	281	58
19	Rigolet	Sep 25–26	54	11	301	33
20	Cartwright	Sep 29	53	42	303	02
21	*St John's, C*	Oct 6– 7	47	34	307	16

[a] These positions are not sufficiently well determined to warrant an accuracy greater than 0° 1 in either latitude or longitude

(Magnetic data gathered on this expedition were not received in time for inclusion in Volume IV of this series, and are accordingly published with those of the following expedition with Land Results of 1921–1926 The more complete narrative will be found with Dr Sverdrup's full report on pages 514–524)

Maud Expedition, 1922–1925—The *Maud* left Seattle, Washington, under command of Captain Oscar Wisting, June 3, 1922, Captain Amundsen having made plans for explorations by means of an all-metal airplane The attempt was, as on the previous expedition, to force the vessel into the ice, this time at a point in the vicinity of Wrangell Island, and to drift across the Arctic Sea to the vicinity of Spitzbergen The vessel was closed in by the ice on August 8 in latitude 71° 16′ north, longitude 184° 54′ east of Greenwich Magnetic observations were made in improvised shelters during the winter, and while made over the sea, the conditions were such that the results are comparable with land observations, and they are accordingly included in the Table of Results of land stations in this volume The hope to drift northward across the Arctic was defeated by the occurrence of a series of very heavy winds, which carried the ice, with which the vessel was drifting, about 100 miles to the south, so that the winter of 1923–24

was spent in the general vicinity of latitude 75° north and longitude 158° east. In August 1924, the vessel was freed from the ice which had held her for the two winters, and the attempt was made, in accordance with a radio message from Captain Amundsen, to get away from the ice and return to Bering Strait The attempt to pass around the eastern side of the New Siberian Islands having proven unsuccessful, these islands were passed on the western side and the mainland was reached at the bay off the Kolyma River, on August 8, 1924, and after futile attempts to proceed eastward, winter-quarters of comparative safety were secured close to Four Pillar Island of the Bear Island group On July 13, 1925, the ice broke again around the *Maud*, and it was possible to proceed eastward, so that on August 22 the expedition was terminated at Nome, Alaska A fuller report of this expedition will be found in the report of Dr. Sverdrup, on pages 519–524

Standardization observations—Wherever feasible, field observers compare their field instruments with those of other organizations in the regions covered. References to such occasions will be found under the work of each observer In 1922, W C Parkinson, on his return to the Office from the Watheroo Observatory, made a trip through western Europe, for the chief purpose of comparing his instruments with the standards of the principal European observatories His itinerary is outlined in detail in his report.

Each field outfit is compared with the standard instrument at Washington before it is sent out, and again on its return The results of the observations with the standards are given in Table of Results under Washington S M O (Standardizing Magnetic Observatory), those obtained by the instrument compared are not given, as a correction is adopted to reduce them to the values obtained by the standards. In March 1924 J W Green took magnetometer 3 and earth inductor 48, the Department's standard instruments, to Cheltenham to secure a direct comparison with the standards of the United States Coast and Geodetic Survey In December 1924, W E. W Jackson, of the Meteorological Service of Canada, visited the Department and made comparisons between the standards of that service (magnetometer C I. W 15, and earth inductor Toepfer 89) with the Department's standard instruments Magnetometer-inductors, made after the C. I. W pattern, by the Precise Instrument Company, Nos. 102 and 105, for the Meteorological Office of Argentina, No 103 for the San Fernando Observatory of Spain, and No 107 for the National Observatory of Mexico, were compared at the Standardizing Magnetic Observatory to determine their correction on the provisional International Magnetic Standards of the Department

SPECIAL FIELD REPORT

H W Fisk, on Observations of the Bermuda Magnetic Anomaly, 1907 and 1922

Two expeditions have been sent by the Department of Terrestrial Magnetism to Bermuda to study the magnetic anomaly known to exist there The first of these was in 1907, the results of which have been published only in part, the second was in 1922, and is further described in the observer's field report on page 142 In 1905 a detailed survey of the distribution of the declination was made throughout the entire colony by J F Cole,[1] in cooperation with Dr E L Mark of Harvard University, director of the Bermuda Biological Station To supplement this valuable work, Dr Mark invited the Department to send an observer as a member of the biological party of the summer of 1907 who should make a similar survey to include particularly the values of the magnetic inclination and horizontal-intensity In response to this invitation, H W Fisk carried out the survey of 1907, making his headquarters with the party at Agar's Island, and enjoying the use of the facilities of the station

The plan of this survey included the establishment of five primary stations at widely separated places, observations being made with usual field instruments and stations being permanently marked for use of future expeditions The results of the observations at these stations and their detailed descriptions are published in Volume I, pages 95 and 178 In addition to these primary stations, it was the purpose to make observations at numerous other points, by a method which would permit of rapid work, but still yield results of sufficient accuracy, when the large change in the magnetic field with slight change of position was taken into account The best instrument available at that time was a Dover dip circle, having provision for making deflections for the determination of total intensity by the Lloyd method, and a compass-attachment for obtaining declination During a stay of about five weeks, besides the primary stations, 78 supplemental stations were occupied, and eye-observations for diurnal variation of declination were made on three days Inclination was determined from the intensity observations with the deflected dip-needle, which often was used also as a regular dip-needle Intensity observations were often abbreviated by the omission of the loaded-dip observations, but the latter were made often enough to control the changes in magnetic moment Where the means of transportation permitted, a theodolite was carried in addition to the dip circle and at such times azimuths were obtained for reliable determinations of the declination, except at those stations reached near the middle of the day, when the position of the Sun was unfavorable As the distances between stations were generally short, the observer most frequently walked, carrying the instrument and tripod On those days, when the position of the Sun and the state of the weather permitted, approximate declinations were obtained by allowing the image of the Sun to fall through the slits in the sighting-vanes of the compass attachment By use of azimuth tables and corrections obtained by experiment, fair values of declination resulted

In selecting supplemental stations, an attempt was made to include as many of those occupied by the *Challenger* in 1873 as could be identified Owing to the meager descriptions and the frequent change of names of islands or localities, close recovery was seldom possible, though in some cases it is believed close approximations were made At the dock-yard the fragment of a stone marker of the *Challenger* station was pointed out by an officer, but the presence in the vicinity of structures and loose magnetic material makes that position of questionable value Some of the other stations at which fairly

[1] *Terr Mag*, vol 13 (1908), pp 49–56

close reoccupations were made are Wreck Hill (No 2), Cricket Ground, Somerset (No 6), Barge Island (Spectacle Island, No 19), Tatem Island (Hawkins Island, No 22), Spanish Point (Cobbler's Island, *A*, No 24), Clarence Cove (No 33), Ducking Stool (No 39 or 40), Governor's Garden (Mount Langton, No 42)

To identify the points of observation, a descriptive name has been applied, and a brief description given To further assist in identification, the geographic coordinates are given to 0 01 minute of arc in both latitude and longitude, the position being scaled from the large-scale maps of the Ordnance Survey (6 inches = 1 mile), which comprise six large sheets, and show sufficient detail to permit very accurate plotting No coordinate lines were printed on the maps and these were supplied, the starting-point for the plotting of these lines was the signal mast at the Ireland Island Dockyard, the position of which was courteously supplied by Captain H P Douglas, R N, who was in charge of the resurvey for the revision of the charts in 1922 to 1923 The position given for this point by Captain Douglas is latitude 32° 19'51 north and longitude 64° 50'28 west Transfer of positions obtained from this point of reference to adjoining sheets was difficult, some inaccuracy being inevitable because of difference in shrinkage of the paper for the different sections, it is believed, however, that errors from this source are of no practical consequence

The results from the observations of 1907 of the Bermuda magnetic anomaly are given in the Table of Results (see pp 105–106)

In 1922 two observers, H W Fisk and J T Howard, made observations amplifying the former survey in important particulars Several regions had been shown by the results obtained in 1907 to be of particular interest, and detailed attention was directed to these The equipment was better adapted for rapid as well as accurate work The use of the compass-variometer to determine horizontal intensity quickly at stations close together, varying according to circumstances from but a few feet to a quarter of a mile apart, made possible the detailed studies of local conditions not practicable with the usual field magnetometers For an account of such work see Volume V, pages 355–357 The method of observing at supplementary stations found most satisfactory was as follows The universal-type magnetometer 14 (see Vol II, pp 7–9, for description) was first set up as for deflections, and the four deflection-angles at a single distance were read If the position of the Sun and the state of the weather permitted, four readings of altitude and azimuth of Sun were next made The mean deflection-angle and a knowledge of the magnetic moment of the deflecting magnet provided means for computing the horizontal intensity, the mean magnetic meridian obtained from the deflections and the altitude and azimuth readings of the Sun supplied the data to determine the declination While one observer set up and adjusted the galvanometer on its tripod, the other replaced the magnetometer by the earth inductor, and a few moments only were required for finding the value of the inclination The whole process could be completed within a half hour The dip-circle feature of magnetometer 14, both for inclination and intensity by the Lloyd method, was found much inferior and was not used at the later stations

When weather or other conditions were unfavorable, the compass-variometer became the intensity instrument It was found desirable to use it in addition to the magnetometer at stations where there was a wide range of value in intensity Occasional comparisons with the magnetometer were made to control changes in its calibration which did not remain constant

The coordinates of the stations of 1922 were found, as were those of 1907 The results for the survey in 1922 at the primary stations and at the supplementary stations are given in the Table of Results on pages 107–108 The values of the horizontal intensity determined by the compass-variometer made in Sandy's Parish, east of Main Road,

extending from Evans' Bay to King's Point, and the geographical positions, together with brief descriptions, are given in Table 59

TABLE 59—*Results of Observations for Magnetic Horizontal Intensity Obtained with Compass-Variometer*

Date and designation	Latitude North	Longitude West	Hor int	Description
1922	° ′	° ′	c g s	
Sep 11, *a*	32 15 66	64 52 05	0 2177	Evans' Bay, *A*, repeat, see No 10
11, *b*	15 69	52 01	2188	Evans' Bay, *B*, repeat, see No 14
11, *c*	15 75	51 98	2231	Half-way along path from Evans' Bay, *B*, to Monkey Hole
11, *d*	15 82	51 98	2275	Monkey Hole, see No 17
11, *e*	15 87	51 97	2306	Old quarry south of house at Rockaway
11, *f*	15 93	51 99	2316	In path above Rockaway, close to Rockaway, *B*, see No 16
11, *g*	16 02	51 92	2331	East of first building north of Rockaway, between water and house
11, *h*	16 06	51 95	2332	About 30 feet north of second boundary wall north of Rockaway, 35 feet from the water's edge
11, *i*	16 13	52 00	2334	About 50 feet south of boundary-line in small bay, the third immediately south of King George's Bay, 35 feet from the water
11, *j*	16 20	52 00	2320	About 10 feet from water at head of long, narrow bay, the second south of King George's bay
11, *k*	16 21	51 96	2339	On end of second point south of King's Point, see No 19 (The highest value of horizontal intensity observed)
11, *l*	16 24	52 03	2315	At head of first bay south of King George's Bay
11, *m*	16 30	51 96	2319	Near end of point on south side of King George's Bay
11, *n*	16 38	52 02	2298	Northwest corner of King George's Bay, 25 feet from water's edge
11, *o*	16 35	51 83	2295	Extreme end of King's Point, see No 21
11, *p*	16 37	52 12	2293	Reoccupation of No 9
11, *q*	16 32	52 15	2300	Road intersection west of King's Point
11, *r*	16 22	52 40	2262	Top of hill on King's Point Road, about 150 yards from Main Road
11, *s*	16 19	52 49	2246	Intersection of Main Road and King's Point Road
11, *t*	15 94	52 31	2270	On Main Road at entrance to Grove estate
11, *u*	15 85	52 23	2265	On Main Road at entrance to Rockaway
Sep 13, *a*	32 15 81	64 52 20	2226	Opposite small shop near entrance to Rockaway
13, *b*	15 76	52 16	2237	On Main Road opposite north end of Evans' Pond
13, *c*	15 64	52 14	2202	On Main Road at junction with road to public wharf at Evans' Bay.
13, *d*	15 72	52 04	2193	Half-way between pond and house east of pond, 30 feet north of stable
13, *e*	15 79	52 08	2212	Point on top of hill one-third way from pond to east-west road
13, *f*	15 83	51 99	2244	Top of ridge about 100 feet north of house, between sound and pond
13, *g*	15 86	52 07	2259	On ridge at Rockaway boundary, 150 feet southeast of Rockaway Quarry, see No 11
13, *h*	15 88	52 03	2264	On edge above quarry
13, *i*	15 88	52 03	2266	In quarry, see No 11
13, *j*	15 89	52 09	2267	In road to Rockaway opposite quarry

In addition to the compass-variometer results as given above, values were read at a large number of points in the vicinity of Mont Royal in Paget, these will be described and discussed elsewhere in connection with special investigations of local variations in that locality

DESCRIPTIONS OF PRIMARY STATIONS, BERMUDA, 1907 AND 1922[1]

Black Bay, 1922—South of main road between Black Bay and east end of Wilson's Island, in old roadway running along high terrace above main road, 14 paces east of boundary wall and about 90 feet (27 4 meters) from road below True bearing left clock-tower, 184° 19′3.

Ireland Island, 1907, 1922—On Moresby's Plain within small mound surrounded by old stone coping, 51 7 feet (15 76 meters) and 54 3 feet (16 55 meters) respectively from southeast and southwest corners of larger platform marked "911 yards", and 71 4 feet (21.76 meters) from north corner of shed used as players' club-house on the cricket-field True bearings left wireless mast at Daniel's Head, 59° 52′4, right wireless mast, 62° 06′4, west corner target bank west of fort, 202° 37′5.

[1] See *Res Dep Terr Mag*, Vol I, p 178, for more detailed descriptions as regards stations of 1907, see also pp 287–288 of this volume for more detailed descriptions as regards stations of 1922

Spectacle Island or Hunt's Island, 1907, 1922—In an open area in western part of the island where there is quantity of soil, surrounded by trees, but open northward to the sea True bearings right wireless tower at Daniel's Head, 141° 16′5, left edge tank at Boaz bridge, 159° 14′1, left clock-tower at dockyard, 180° 34′2, vane on Gibbs' Hill Lighthouse, 351° 28′2

Agar's Island, 1907, 1922—Near west end of low southern portion of island, over marking-stone set in 1907 True bearings Gibbs' Hill Lighthouse, 27° 52′7, old beacon on south side of Two-Rock Passage, 44° 46′0, left wireless mast on Daniel's Head, 100° 53′5, left clock-tower at dockyard, 146° 52′5

Mont Royal, A, 1922—On vacant lot once planting-ground east of house at Mont Royal, 18 feet (5 5 meters) west of path leading down to Main Road, 48 feet (14 6 meters) from boundary of lot where line to lighthouse passes over south gate-post west of house True bearings Gibbs' Hill Lighthouse, 56° 24′9, spire on A M E Chapel, 26° 35′1, north corner Mont Royal, 92° 35′4, right wireless mast, 110° 21′3, flagpole near house on hill, 351° 47′6

Mont Royal, C, 1922—On hill under shade of large trees near boundary to Mount Pleasant, 104 feet (31 70 meters) east of Mont Royal, *A*, on line from south edge of false chimney on north corner of Mont Royal produced through station *A* True bearings Gibbs' Hill Lighthouse, 56° 37′2, south edge north chimney on Mont Royal, 89° 23′7

Agricultural Station, 1922—In experiment gardens south of offices, south of east-west cross-driveway and northwest of old shed surrounded by high hedge, 10 feet (3 meters) south of edge of cross-road and 76 5 feet (23 32 meters) west of fence bounding grounds on east, under group of trees which provide shade for greater portion of day True bearings north corner at top of chimney on superintendent's residence, 138° 56′1, near corner of farmhouse, 216° 35′5, east corner of same house 217° 53′1, apex of dormer of Southsea, 358° 00′6

Nonsuch Island, 1907, 1922—On top of ridge about 100 meters west of west hospital building, just west of limit of low scrub that covers that portion of island, about 35 feet (10 7 meters) from cliff that drops abruptly to sea on northwest, and about 50 meters from water's edge down more gradual slope to south The stone left to mark station in 1907 was later found 15 feet (4 6 meters) northeast of point occupied in 1922 and 10 feet (3 0 meters) north of line from station to roof of women's ward at hospital The marker of 1907 was buried beneath pile of loose stones True bearings observation tower called "The Peak", 62° 49′8, left edge of Martello Tower, 110° 38′4, signal mast Fort George, 156° 14′5, top of roof of women's ward, 241° 35′8, sharp pinnacle in left portion of Gurnet Rock, 345° 59′7

St George, 1907, 1922—On park lands north of town between Poorhouse and Fort Victoria 26 feet (7 9 meters) west of edge of cut through which road passes northward from park gate, 68 feet (20 7 meters) southwest of boundary stone at north end of cut on east side of road, and exactly in line with signal mast at Fort George and south edge of Poorhouse, and in line from St David's Lighthouse and square church tower on hillside toward town, marked by coral stone coated with cement in top of which diagonal lines were drawn and lettered "CIW XXII". True bearings southeast corner of St George Hotel, 4° 44′2, south corner of Poorhouse, 59° 52′6, flagpole at Fort Victoria, 242° 23′4, St David's Lighthouse, 311° 27′2

DESCRIPTIONS OF SECONDARY STATIONS, BERMUDA, JULY AND AUGUST 1907

(1) *Daniel's Head*, 1907—On extreme southwesterly projection of promontory as near edge as it was convenient to work True bearing Somerset church, 329° 20′

(2) *Wreck Hill*, 1907—On summit of hill at point 31.5 feet (9 60 meters) southeast from southeast corner of old pilot lookout house, pilot mast stands about midway on line joining station and southeast corner of house Approximate true bearing Gibbs' Hill Lighthouse, 302° 24′

(3) *Tudor Hill*, 1907—Among bushes, as near summit of Tudor Hill as could be attained Approximate true bearings Somerset church, 184° 20′, Hogfish beacon, 225° 51′, lighthouse, 289° 39′

(4) *Whitney Bay*, 1907—Near south shore of Whitney Bay, in unused roadway marked by military monuments A monument stands near fence about 150 feet (46 meters) west of station

(5) *Scaur Lodge*, 1907—On lawn before lodge, 55 feet (16 8 meters) west of wall bounding grounds along highway, 19 feet (5 8 meters) south of driveway leading into dooryard, and 30 feet (9 1 meters) east of concrete platform standing near driveway Approximate true bearing lighthouse, 313° 01′

(6) *Cricket Ground*, 1907—Near center of south side of Somerset Cricket Grounds or Naval Recreation Park, 104 feet (31 7 meters) from southeast corner of players' shelter, 63 feet (19 2 meters) from southwest corner of concrete cricket-pitch, and 83 feet (25 3 meters) and 82 5 feet (25 2 meters) from two large trees standing by wall to southwest and southeast respectively, these trees are 42 feet (12 8 meters) apart True bearings southeast corner of pavilion, 76° 51′, telegraph-post in line with cottage chimney, 145° 33′, monument at northeast corner, 244° 58′, nearest corner of large house, 314° 44′

(7) *Mangrove Bay*, 1907—Near extremity of point extending across north side of Mangrove Bay, in line through signboard on point and central pier of drawbridge between Somerset and Boaz, about 29 feet (8 8 meters) from bank on north, 55 feet (16 8 meters) from bank on south in line with wharf, and 12 feet (3 7 meters) northwest of mound used as firing-point in target practice True bearings northwest corner of shed at pier, 26° 02′, signal mast at fort, 239° 25′, east gable of red roof, 296° 03′

(8) *Tatem Point*, 1907—Near extremity of Tatem Point, about 100 feet (30 meters) west of channel which is filled at high-water, making island of extreme point, about 15 feet (4 6 meters) from north and south shore-lines, and large flat rock is about 4 feet (1 2 meters) west and smaller one about the same distance east of station Approximate true bearings cathedral at Hamilton, 269° 00′, lighthouse, 328° 44′

(9) *Port Royal Bay*, 1907—Between Whale Bay and Evans' Bay, in by-road leading from Whitney Bay station to main road, about half-way up hill from Port Royal Bay, at point where road forks

(10) *Evans' Bay*, 1907—Under some trees on west side of Evans' Bay, about 10 rods (50 meters) from end of bay, where by-road runs up hill to some small cottages to west

(11) *Frank's Bay*, 1907—In open space near shore on east side of Frank's Bay, about 20 rods (100 meters) north of road and east of large residence, at point where there is an old stone house used as stable The point is just below where ground begins to slope toward bay

(12) *Wilson's Island*, 1907—West of Port Royal, on shore opposite Wilson's Island, at point just north of clump of bushes along north side of road

(13) *Morgan's Island*, 1907—Near eastern extremity of island, about 120 feet (36 meters) from most easterly point, about 150 feet (46 meters) from shore-line to southward, and 35 feet (10 7 meters) south of southeast corner of old pit True bearings west clock-tower, 190° 50′, Hogfish beacon, 207° 22′, south tower on cathedral, 245° 28′, lighthouse, 325° 37′

(14) *Cemetery*, 1907—Along west shore, 115 feet (35 meters) west of northwest corner of cemetery and south of Masonic Building, two cedar trees, 42 feet (12 8 meters) apart are respectively 45 feet (13 7 meters) northeast and 27 feet (8 2 meters) southeast of station, and telephone-pole stands 12 feet (3 6 meters) northwest True bearings flagpole, King's Point, 73° 08′, "T piece," 138° 04′, magnetic station, Moresby's Plain, 219° 40′, west corner of cemetery, 298° 27′

(15) *Sailors' Home*, 1907—In open space just north of grounds of Royal Sailors' Home, southeast of old quarry pit, 85 feet (25 9 meters) from line of palings around some wooden buildings to northeast, and 35 feet (10 7 meters) from stone wall, topped with broken glass, along south Three small trees are 15 feet, 10 feet, and 10 feet (4 6 meters, 3 meters, and 3 meters) to southeast, south, and southwest, respectively True bearings center of north entrance to Home building, 5° 36′, west corner of paling, 191° 07′, north gable of building, 304° 03′

(17) *Challenger Stone*, 1907—About 400 feet (122 meters) distant from large steel floating dock and close to road, over fragment of stone with cemented top flush with surface in place where building material had been stored, and where ground was thickly strewn with débris containing much iron The portion of stone remaining bears the letters "—ENGER—873" About 75 feet (23 meters) southward from house (possibly the "Mitchell's Store" of the *Challenger* description) and 50 feet (15 2 meters) eastward from fence along cliff overlooking Moresby's Plain ("Moresby's Plain" station not visible on account of hill and fence) True bearings signal mast, 221° 09′, Hogfish Beacon, 310° 50′, east gable of red roof, 316° 38′

(18) *Gibbs' Hill*, 1907—Near old pilot mast on summit of Gibbs' Hill, about one-fourth mile (0 4 km) west of lighthouse, on east edge of abandoned quarry pit, about 25 feet (8 meters) east of old boundary wall, and about 35 feet (11 meters) from trees and shrubs to southward True bearing lighthouse, 272° 20′

(21) *Burt Island*, 1907—On narrow neck near northwest corner of island, at edge of clump of cedars about 20 feet (6 meters) southward from group of high rocks, 75 feet (22 9 meters) from water

to northeast and about 200 feet (61 meters) to water westward, the extreme northern point is about 150 feet (46 meters) distant, and an old concrete pier at water's edge is in line with channel south of Marshall Island True bearings lighthouse, 17° 43′, flagpole, Ports Island, 212° 51′, south tower of cathedral, 243° 41′

(22) *Hawkins Island* (*Tatem Island of Challenger report*), 1907—At summit above concrete steps about midway of north side of island, on highest point 25 feet (7 6 meters) south of second turn of roadway, where line to Gibbs' Hill Lighthouse passes midway between two cedars about 14 feet (4 meters) distant True bearings Gibbs' Hill Lighthouse, 9° 20′, west clock at dockyard, 171° 33′, magnetic station at Agar's Island, 250° 14′, channel range board near World's End, 264° 53′

(23) *Nelly Island*, 1907—Near middle of summit of bare knoll, standing rather higher than adjacent lands, between two artificial reservoirs, about 10 feet (3 meters) east of highest point of island True bearings Gibbs' Hill Lighthouse, 16° 19′, magnetic station at Agar's Island, 233° 30′

(24, 25) *Cobbler's Island*, 1907—Station *A* is near center of island over government marker about 2 feet (0 6 meters) high with letter "A" and crowfoot on western face True bearings Gibbs' Hill Lighthouse, 13° 27′, Hogfish Beacon, 233° 02′, flagpole near house on adjacent mainland, 291° 35′ Station *B* is about 125 feet (38 meters) east along axis of island toward flagpole south of large stone house on main island True bearings Gibbs' Hill Lighthouse, 13° 45′, flagpole on mainland, 248° 25′

(26) *Spanish Point*, 1907—On Plaice's Point, one of smaller points that are included in large locality known as Spanish Point, very nearly in line from station on Agar's Island to Commissioner's House on headland at northern extremity of Ireland Island Along this line it is 126 feet (38 4 meters) to edge of bank toward southeast and 106 feet (32 3 meters) to edge of bank to northwest, and about 150 feet (46 meters) to water's edge westerly, measured over ruins of old stone structure True bearings Gibbs' Hill Lighthouse, 16° 36′, clock-tower at dockyard, 143° 46′, magnetic station at Agar's Island, 332° 45′

(30) *Small Island No 1*, 1907—At center of small islet, south of Two-Rock Passage, nearest islet to Long Island in chain joining Agar's Island and Long Island True bearings lighthouse, 28° 01′, clock-tower at dockyard, 160° 59′, station at Agar's Island, 225° 31′, station at Dyer Island, 318° 43′

(31) *Dyer Island*, 1907—Approximately 250 feet (76 meters) from western extremity of island, about 150 feet (46 meters) from north shore, and about 100 feet (30 meters) from south shore It is in by-road which runs along top of ridge through sage and cedar brush, line joining Shares Point station and Gibbs' Hill Lighthouse passes through station True bearings Gibbs' Hill Lighthouse, 30° 46′, magnetic station at Agar's Island, 187° 20′, south tower of cathedral at Hamilton, 252° 34′

(32) *Small Island southeast of Fern Island*, 1907—At center of small islet, southeast of Fern (or Sin) Island, and south of Marshall Island True bearing lighthouse, 32° 28′

(33) *Clarence Cove*, 1907—To westward from landing on rather high, rocky table along water's edge, 24 feet (7 3 meters) to edge of cliff northward, 108 feet (32 9 meters) to pipe standing out of ground westward, and 70 5 feet (21 49 meters) to edge of cliff eastward True bearings signal mast, Admiralty house, 40° 12′, clock-tower, 125° 03′, St David's Lighthouse, 246° 26′, signal mast, Government House, 282° 27′

(34) *Point Shares*, 1907—On point about 15 feet (4 meters) from water's edge, and about 10 feet (3 meters) from small lone cedar tree True bearings Gibbs' Hill Lighthouse, 30° 51′, magnetic station at Agar's Island, 99° 49′

(35) *Channel Island*, 1907—Near north end of small islet by which is placed range marking Two-Rock Passage, about midway of northern part, where bare rock meets grass-covered soil, and southeast of rock sometimes called "World's End", in line joining station on Dyer Island and south tower of cathedral True bearings lighthouse, 35° 05′, magnetic station at Agar's Island, 125° 03′, south tower of cathedral, 252° 34′

(36) *Warwick Church*, 1907—Across small garden northeast of Warwick Church, on north margin of by-road where it crosses boundary-line marked by fragments of stone wall

(37) *Cross Roads*, 1907—Observations were made under group of cedars in southeast angle of intersection of road south of Poorhouse with road marking boundary between Paget and Warwick parishes

(38) *Swan's Bay*, 1907—West of Swan's Bay, north of road, at point where the rocky margin between road and sea is unusually wide, north of grove of shrubby cedars, 80 feet (24.4 meters)

northwest of gateway where cart track leaves road The cliff is 60 feet (18 3 meters) north, 75 feet (22 9 meters) east, and 150 feet (46 meters) west of station

(39) *Ducking Stool, 3,* 1907—About 81 paces west of Ducking Stool, *1,* in line with chimney near Swan's Bay

(40) *Ducking Stool, 1,* 1907—North of highway west of bathing-pool, 107 feet (32 6 meters) from end of hedge west of by-road leading to pier, 13 feet (4 meters) west of an old quarry pit, 112 feet (34 1 meters) from top of steps down to landing, and 34 feet (10 4 meters) northwest of sign-board True bearings chimney on house near Swan's Bay, 82° 40′6, flagstaff at Admiralty House, 91° 57′ 1, clock at dockyard, 114° 28′1

(41) *Ducking Stool, 2,* 1907—About 225 paces east of Ducking Stool, *1,* 21 paces south of high picket fence, and 40 paces north of road

(42) *Mount Langton (old station),* 1907—Over pedestal in garden, 17 5 feet (5 3 meters) from wall, and is covered with coating of cement plaster, in top of which is drawn set of grooves to receive tripod

(43) *Mount Langton (new station),* 1907—On high knoll in garden just south of west entrance to grounds, in pathway around western crest of knoll, 67 5 feet (20 6 meters) from wall, along cut on north, 63 feet (19 2 meters) southwest of pedestal, is 15 feet (4 6 meters) from cedar on east side of path southward, and 14 feet (4 3 meters) from cedar on west side of path northward, and a little south of line from pedestal to lighthouse True bearings Gibbs' Hill Lighthouse, 40° 26′0, center of signal mast (approximate), 161° 25′, chimney on east end of house across valley, 325° 08′4

(44) *Paget (Crow Lane) Church,* 1907—In meadow west of Paget (Crow Lane) Church, about 50 and 65 paces from east and south sides respectively

(45) *Poorhouse, Hamilton,* 1907—North of Pembroke Poorhouse

(46) *Ducking Stool, 4,* 1907—About 254 paces west of Ducking Stool, *1,* in line with chimney at Swan's Bay

(47) *Crow Lane,* 1907—At eastern extremity of Crow Lane or Hamilton Harbor between water and road to Salt Kettle, where road makes a turn at southeastern corner of harbor

(48) *Prospect, Hamilton,* 1907—At intersection of two roads southwest of Prospect Camp

(49) *Crow Lane, Hamilton,* 1907—About one-fourth mile (0 4 km) from water along road running east from eastern extremity of Crow Lane Harbor

(51) *Trimmingham Hill,* 1907—In west edge of garden patch on south side of south road, just east of by-road from Hamilton to Hungry Bay

(52) *Camden,* 1907—Opposite Camden gate, along road running east from eastern extremity of Crow Lane Harbor

(53) *Doe Bay,* 1907—East of parish-line at Doe Bay

(54) *Grocery Store,* 1907—On middle road east of grocery store

(55) *Devonshire Church,* 1907—In an open space beside road west of Devonshire church

(56) *Sue Wood Bay,* 1907—On south side of road opposite Sue Wood Bay, at east end of row of palmettos, and near junction with by-road leading northwesterly

(57) *Bowen Point,* 1907—Near extremity of Bowen Point, on narrow ridge between two old quarries, eastern one is a pit, western one extends down hill to shore, the point is about 20 feet (6 1 meters) from eastern edge of latter

(58) *Burchall Cove,* 1907—On high point near shore north of Burchall Cove, about 150 feet (46 meters) from channel entering cove, and about 12 feet (3 7 meters) from very narrow chasm forming inlet north of cove The point is about 80 feet (24 meters) from water in cove, measured down slope.

(59) *Bean's Shop,* 1907—On knoll, under two cedars, 82 paces southeast of Bean's Shop, and 33 paces east of road in front of Davis's store

(60) *Major's Bay,* 1907—On south side of Major's Bay, in pathway about 10 paces from water and about 50 paces from west end of bay

(61) *Flatts Bridge,* 1907—East of road and north of bridge, 8 paces west of southwest corner of small quarry pit, 8 paces southeast of tree, and 30 paces north of north end of wall.

(62) *Harrington Road (south)* 1907—On slight elevation south of main road, south of Harrington Sound, and just north of junction with by-road leading over hill toward Spittal Pond

(63) *Spittal Pond*, 1907—Near east side of military road, about halfway from its juncture with south road and point where it turns east along pond

(64) *Ferry Point*, 1907—On main island of St George's, nearly opposite Rogue Island, at point on old ferry road about 50 paces east of wall bounding War Department lands on east

(65) *Walsingham*, 1907—Near shore on point north of Walsingham Bay

(66) *Harrington Road (east)* 1907—South of road along east side of Harrington Sound, at intersection with by-road leading to Mangrove Lake

(67) *Devil's Hole*, 1907—Near Devil's Hole, south of intersection of two main roads

(68) *Mangrove Lake*, 1907—West end of Mangrove Lake, at junction with by-road over hill to Devil's Hole

(69) *Harrington Road (northeast)*, 1907—Along road on east shore of Harrington Sound, at intersection with road leading to Trott's Pond

(70) *Trott's Pond*, 1907—North of Trott's Pond, east of intersection with road running north.

(71) *Tuckerstown, (A M E)*, 1907—South of road leading west from Tuckerstown, and at junction with road leading to Paynter's Hill

(72) *Paynter's Hill*, 1907—Near summit of Paynter's Hill

(73) *Tuckerstown (west)*, 1907—Beside road west of village of Tuckerstown.

(74) *Tuckerstown (north)*, 1907—On shore north of Tuckerstown and east of Paynter's Hill

(75) *Tuckerstown Landing*, 1907—North of Tuckerstown Landing

(77) *Jones Island*, 1907—On north shore of Jones Island, on margin of sand beach

(78) *Surf Bay*, 1907—On narrow isthmus, very high and apparently formed of drifted sand, between Castle Harbor and Surf Bay, immediately above sheltered cove and sand beach on Castle Harbor side True bearing St David's Lighthouse, 220° 36′2

(79, 80) *Nonsuch Island*, 1907—Station *B* is about 6 feet (2 meters) south of E D Preston's station of 1890, 80 feet (24 4 meters) northwest of flagpole, 56 feet (17 1 meters) from northwest corner of new kitchen, 100 feet (30 5 meters) from northwest corner of men's ward, 22 feet (6 7 meters) from edge of path to landing, and 67 feet (20 4 meters) from southeast corner of keeper's house True bearing St David's Lighthouse, 212° 50′0

(81) *Smith's Island*, 1907—On east end of Smith's Island, about 4 rods (20 meters) from shore

(82) *St David's Lighthouse*, 1907—On hillside 76 paces south of St David's Lighthouse, 47 paces southeast of tank, and 49 paces northwest of corner of Fox's house. True bearing mast, Tuckerstown, 48° 37′8

(83) *North Rock*, 1907—At North Rock, at low tide, on shoal slightly awash, a few feet southwest of main rock True bearing extreme left of visible land, 316° 25′2

DESCRIPTIONS OF SECONDARY STATIONS, BERMUDA, JULY TO SEPTEMBER 1922

(1) *Wreck Hill*, 1922—On summit of hill on flat space north of ruins of old fort

(2) *Hog Bay*, 1922—Northeast of Spring Benny Hill on low ground between two fields, on south side of low graded path or roadway, in line of cedar row near its west end, about 50 meters west of roadway leading south to some houses on low hill

(3) *Scaur Lodge*, 1922—Very close reoccupation of station of 1907 On lawn before the lodge, 55 feet (16 8 meters) west of wall above road, 19 feet (5 8 meters) south of drive leading to house and 30 feet (9 14 meters) from concrete platform near driveway

(4) *West Whale Bay*, 1922—In edge of grove of cedars south of roadway leading to beach, about 100 meters from high water-line

(5) *The Grove*, 1922—Just west of northwest corner of large field, under some unusually large cedars, about 150 meters south of estate called The Grove, and is reached by turning west from main road about 250 meters north of Salvation Army Hall

(6) *Bassett's Cave*, 1922—In pasture land on hillside about 150 feet (45 7 meters) from water's edge, and 300 meters west of Bassett's Dock

(7) *Polly Dicky Hill*, 1922—On hill about 500 feet (152 meters) west of point where road turns in to Evans' Bay public wharf, southeast of farm buildings, in bush, about 100 feet (30 meters) down slope from summit Lighthouse bears 282° 49′ west of south

(8) *Green's Hill*, 1922—On side hill in cart road about 120 meters west of buildings called Bel Air, west of west end of marsh

(9) *King's Point, A*, 1922—On brow of hill south of road leading to extremity of point, about 30 feet (9 1 meters) west of boundary wall running southward to western extremity of George's Bay

(10) *Evans' Bay, A*, 1922—Over stump 33 feet (10 06 meters) west of road leading to public wharf, about 50 feet (15 2 meters) from bay, near point where path leading by stone steps up hill to house joins the road to wharf

(11) *Rockaway Quarry*, 1922—In quarry pit on land belonging to Mr Adcock, and from which hard stone is being quarried for road repairing

(12) *Rockaway Cave*, 1922—At mouth and on hill over site of Mr Adcock's fresh-water cave near south boundary of his property, also in hole about 20 feet (6 10 meters) below surface at mouth

(13) *Mangrove Bay*, 1922—Close reoccupation of the station of 1907, 12 feet (3 66 meters) west of coping of old firing-stand on rifle-range, 29 feet (8 84 meters) from bank to north, and 55 feet (16 76 meters) from bank southeast True bearings, northwest corner of shed at public wharf at Mangrove Bay, 27° 23′, signal mast at Ireland Island, 238° 33′, east gable of Paynehurst in Paget, 296° 18′

(14) *Evans' Bay, B*, 1922—North of public wharf, in old quarry near bay, about 15 feet (4 6 meters) from west wall of pit

(15) *Rockaway, C*, 1922—On hill west of house across wall in adjoining property, in small clump of cedars at south corner of cultivated field

(16) *Rockaway, B*, 1922—On hill side, in roadway leading up from house, about 20 meters above first turn to left, on west side of road, under small cedar

(17) *Monkey Hole*, 1922—Among bushes in footpath above small cove called Monkey Hole

(18) *Jennings' Bay, A*, 1922—Declination observations were made on north side of Main Road about opposite Jennings' Bay, in bush about 50 meters from road through gap in wall, west of large field, and opposite a small field lying between two hills on south side of Main Road

(19) *Glebe Point*, 1922—Near extremity of second point south of King's Point, on glebe-lands, in southeast corner of cultivated garden land

(20) *Jennings' Bay, B*, 1922—At north corner of field opposite end of Jennings' Bay, in scrub cedars at end of cart trail entered at station *A*

(21) *King's Point, B*, 1922—Among the bushes on sloping ground at extremity of King's Point (Two localities are called King's Point, Nos 9 and 21 are opposite Tucker's Island)

(22) *Tucker's Island, West*, 1922—Near south shore of island about 200 meters from western extremity just west of concrete drain from old prison ruins to water's edge

(23) *Frank's Bay, West*, 1922—About 250 meters west along shore from head of bay, in cartway which leaves Main Road just east of old stone storehouse, about 100 feet (30 5 meters) from the water and 30 feet (9 14 meters) west of clump of oleanders

(24) *Frank's Bay, East*, 1922—On point at east side of bay, north of Glasgow Lodge, in quarry pit, 6 feet (1 83 meters) north of quarry wall, and about 100 feet (30 5 meters) from water's edge

(25) *Tucker's Island, Cave*, 1922—On level ground just above entrance to cave, about 20 feet (6 10 meters) north of wire fence along the steep bank at cave's mouth, also within cave on level area just above water standing at approximately sea-level

(26) *Deep Well*, 1922—In edge of trees at southwest corner of field which lies just east of the site of deep well.

(27) *Morgan's Island, B*, 1922—Near south shore of island somewhat to west of middle of that side, just west of old concrete oven which is part of prison ruins

(28) *Morgan's Island, A*, 1922—At eastern extremity of island near water's edge, just north of group of buildings, east of quarry pit

(29) *Port Royal Church*, 1922—Across road west of church under some large cedars, 23 feet (7 01 meters) from large tree to south and 18 feet (5 49 meters) from one to north, 40 feet (12 19 meters) from wall around church yard

(30) *Wilson's Island*, 1922—On mainland on narrow grassy plot near water's edge north of Main Road, where line to bridge joining Boaz and Ireland islands touches the eastern edge of Wilson's Island

(31) *Grace Island*, 1922—On west side of island near center of patch of red earth in slight depression between high, rocky portions toward north and south ends of island

(32) *Gibbs' Hill*, 1922—In an old quarry pit down slope to south of lighthouse 6 5 feet (1 98 meters) from angle in north wall of pit, and 11 feet (3 35 meters) from west wall (An artificial disturbance may arise from nearness of lighthouse to this station)

(33) *Sinky Bay*, 1922—On narrow terrace down steep slope south of Military Road, immediately above head of Sinky Bay.

(34) *Perinchief's Bay*, 1922—North of Main Road, east of house occupied by Mr White, and nearly opposite house of Fred Simmons

(35) *Burgess Point*, 1922—On north side of point, about 200 meters east of its extremity, and 50 meters from water's edge, well up slope, among bushes

(36) *Hawkins Island*, 1922—Reoccupation of station of 1907 on hill on north side of island, 25 feet (7 62 meters) south of second road above concrete steps, 14 feet (4 27 meters) north of each of two trees standing near together apart from other trees True bearings Left clock-tower, Ireland Island, 171° 21′, beacon at east end of Long Island, 266° 32′

(37) *Burt Island*, 1922—Near northwest corner of island, about 100 feet (30 5 meters) from shore to west, 6 paces from a concrete platform which stands 10 paces from shore to north, and 6 paces from pile of whitewashed stones to eastward True bearings Gibbs' Hill Lighthouse, 17° 14′, left edge of tank on Boaz Island, 138° 22′

(38) *Nelly Island*, 1922—On high knoll between two water-catches near south end of island, 19 paces south of edge of more northerly, and about 150 feet (45 7 meters) northeast of edge of other. True bearings Gibbs' Hill Lighthouse, 15° 50′, beacon north side of Two-Rock Passage, 232° 15′

(39) *Riddle's Bay*, 1922—West of golf club-house on north side of small bay, west of old foundation, south of road, under some small cedars

(40) *Ports Island*, 1922—On slope near southwest corner of island, 15 paces from shore, and just below footpath Gibbs' Hill Lighthouse bears 20° 01′ west of true south

(41) *Long Island*, 1922—Near eastern end of Long Island, about 300 feet (91 4 meters) from shore to north and about 150 feet (45 7 meters) from shore to south True bearings Gibbs' Hill Lighthouse, 24° 30′, left clock-tower, Ireland Island, 158° 25′

(42) *Spanish Point*, 1922—On Plaice's Point, south of Peter Tucker's Bay, 40 feet (12 19 meters) southwest of corner of old quarry pit, and 30 feet (9 14 meters) southeast of foundation of old ruins measured in line to clock-tower on Ireland Island True bearings Gibbs' Hill Lighthouse, 16° 44′; clock-tower in dock-yard, 144° 34′, northwest corner Belmont Hotel nearly in line with station on Agar's Island, 332° 50′

(43) *Main and North Roads, Warwick*, 1922—On plot of open grass-land in northeast intersection of the two roads, about 30 and 50 feet (9 1 and 15 2 meters) from boundary walls to south and east, respectively

(44) *Spithead*, 1922—About 1,000 feet (305 meters) along the North Road, west of house on Spithead on by-road turning up hill to south through narrow cut in rock, about 125 feet (38 1 meters) from south side of North Road, directly opposite stable back of farm-house across small field to westward

(45) *Fern Island*, 1922—Not on Fern Island, but on unnamed island southeast of Fern Island and south of Marshall Island, near middle of the highest ground True bearings Gibbs' Hill Lighthouse, 32° 44′, left gable of Paynehurst, 278° 43′

(46) *Two-Rock*, 1922—About 20 paces east of western extremity of small island on south side of Two-Rock Passage, 25 paces southwest of beacon. True bearings Gibbs' Hill Lighthouse, 26° 35′, left clock-tower at Ireland Island, 149° 47′

(47) *Dyer Island*, 1922—Near west end of island, in footpath, 83 paces from western extremity, and about 50 paces from north shore. True bearings Gibbs' Hill Lighthouse, 25° 59′, left clock-tower, Ireland Island, 151° 41′

(48) *Agar's Island*, 1922—Readings with compass-variometer 2 at following points (*a*) on stone marking primary station, (*b*) at Carnegie *B*, 103 feet (31 39 meters) west of primary station, (*c*) near east end of low peninsula which forms southern portion of island, (*d*) about in middle of low isthmus joining southern portion to main island at foot of hill below quarters, (*e*) north of magazine, southwest of laboratory

(49) *Warwick Long Bay*, 1922—South of Military Road, near monument marked "W D 15" where the road leading westward makes a sharp turn to the right, 45 feet (13 72 meters) south of gap in oleander hedge somewhat east of monument, 40 feet (12 19 meters) down slope from oleanders to eastward, 30 feet (9 14 meters) north of offset in military trench, and about 30 feet (9 14 meters) east of branch of trench

(50) *Warwick Camp*, 1922—In same general locality as preceding station

(51) *Mill Shares*, 1922—In roadway above place known as "Undercliff," near south side of road, at junction with road leading north, about 50 feet (15 2 meters) west of near corner of tank at foot of small catch True bearings Gibbs' Hill Lighthouse, 28° 21′, flagpole at Undercliff, 54° 53′, northwest spire of cathedral, 280° 11′

(52) *Warwick Church*, 1922—On hill among bushes north of east end of church, 25 feet (7 62 meters) north of offset in wall around outbuilding, 15 feet (4 57 meters) northwest of a cedar tree

(53) *Khyber Pass*, 1922—Near east side of road at upper end of pass opposite quarry, also in pass 91 feet (27 74 meters) down hill near east wall, and at point on top of cut directly above second point.

(54) *Channel Island*, 1922—Near center of small rocky islet a short distance southeast of smaller rock known as "World's End"

(55) *Deep Bay*, 1922—East of Deep Bay, about 45 feet (13 72 meters) north of North Road, 30 feet (9 14 meters) east of cliff on east side of bay, and 36 feet (10 97 meters) from cliff over sea at north True bearings flagpole at Admiralty House, 101° 13′; flagpole at Commissioner's House, Ireland Island, 132° 33′, signal mast at Mount Langton, 278° 49′

(56) *Spectacle Island* (*Paget Parish*), 1922—On west end of island, about 50 feet (15 2 meters) east of water's edge

(57) *Cricket Ground, Warwick Parish*, 1922—In roadway near wall on southwest side of cricket field, about 100 feet (30 5 meters) from Main Road

(58) *Belmont*, 1922—Six paces south of flagpole at entrance to Belmont Hotel from Harbor Road, more commonly called the North Road

(59) *Darrell's Wharf*, 1922—About 100 feet (30 5 meters) west of Angel's Grotto, 5 paces south of North Road, behind an oleander hedge, 5 paces north of stone wall, 5 paces west of stone steps leading up from road, and 12 paces west of boundary-wall of Rosemeath

(60) *Sand Hill*, 1922—About one mile west of Paget-Warwick boundary, along South or Military Road, on sandy hill in pasture lands south of road, about 125 feet (38 1 meters) south of road, 15 feet (4 57 meters) north of cliff above beach, and about 40 feet (12 2 meters) east of deep gully leading through from road to sea.

(61) *Doctor's Island*, 1922—On highest point of island about 75 feet (22 9 meters) west of small bath-house True bearings Gibbs' Hill Lighthouse, 44° 26′, left edge tank on Boaz Island, 131° 38′

(62) *Fairyland*, 1922—In lot in northeast angle between Serpentine and Pittsbay roads, 25 feet (7 62 meters) north of wire fence along Serpentine Road and 15 feet (4 57 meters) south of north corner of fence, and about 10 meters east of gate

(63) *Pittsbay* (*North*), 1922—About 100 meters east along Spanish Point Road from its intersection with Pittsbay Road

(64) *Swan's Bay*, 1922—About 150 meters west of intersection of Northland Road with North Shore Road, north of road on point where there is more than usual distance to the water, about

20 feet (6 10 meters) north of group of cedar scrubs, about 60 feet (18 29 meters) north of wall along road and 60 feet (18 29 meters) from cliff above sea.

(65) *Northland Road, West,* 1922—On west side of road, on summit of hill, near gateway and entrance to private grounds, driveway passes along north side of residence to stables and outbuildings at rear

(66) *Southland Road,* 1922—At intersection of South Military Road and road leading northward passing to east of Southland estate to Main Road at Presbyterian church, and within triangle formed at this road intersection.

(67) *Northland Road, East,* 1922—About 50 feet (15 2 meters) east of Northland Road, south of summit of hill between Spanish Point Road and North Shore Road, opposite stone shed, in old overgrown quarry.

(68) *A M. E. Chapel,* 1922—On west side of Paget-Warwick boundary road, at entrance to A. M. E chapel.

(69) *Simmons Beach,* 1922—On south side of south Military Road, in by-road leading past Simmons's cottage to path leading down cliff to bathing-beach, between oleander hedge on east and cultivated field on west

(70) *Lazy Corner,* 1922—In southeast intersection of Paget-Warwick boundary road and road between Main Road and South Military Road, in group of small cedars

(71) *South Shore Hill,* 1922—On summit of hill on south shore, just west of Paget-Warwick boundary, among low cedar bushes, north of footpath, and 7 paces northwest of edge of quarry pit

(72) *Paget-Warwick Road,* 1922—On east side of road, about 100 meters north of South Military Road, 14 paces east of edge of road from point 14 paces north of gateway through wall to George De Shield's premises.

(73) *Ducking Stool,* 1922—North of North Shore Road, 33 paces west of wall in line with west side of road leading past Mount Langton to Hamilton, 12 paces from north side of road (A battery of field guns inclosed by iron fence has been mounted over 1907 station.)

(74) *Mount Langton,* 1922—Garden pedestal has disappeared and place is overgrown and inaccessible, station is near site of pedestal, in roadway, about 10 meters south of edge of cut through which road to Government House and grounds passes

(75) *Colored School, Paget,* 1922—East of road north of school-house which stands at intersection of north-south road with Main Road

(76) *Elba Beach,* 1922—South of Military Road opposite Elba Beach, south of Middleton Hill, where road makes a 45-degree turn, in row of large cedars bordering road, with cultivated field on low ground to southward.

(77) *Paget Church,* 1922—In south corner of open field southwest of chapel of St. Paul's Church, 16 paces from wall along Main Road, and same distance from wall along east side of Valley Road.

(78) *Mangroville,* 1922—East of Red Hole where Shore Road makes sharp turn, between road and shore, 42 feet (12.80 meters) southwest of flagpole standing in triangle in road intersection in front of Mangroville, 28 feet (8 53 meters) southwest of end of sea-wall, 30 feet (9 14 meters) northeast of large cedar tree.

(79) *Trimmingham Hill, A,* 1922—North of Main Road, just east of summit north of Bellevue and south of Trimmingham Hill.

(80) *Trimmingham Hill, B,* 1922—Near foot of hill, on north side of Main Road, about 300 meters east of station *A*, about 100 feet (30.5 meters) from road, east of boundary line of trees between two fields running northward from point opposite old shed with iron roof, house to which shed belongs stands close to road farther eastward.

(81) *Hungry Bay, A,* 1922—North of Main Road, in east corner of field on farm, just east of Public Garden, about 50 feet (15 24 meters) north of road, in cart track along wall east of which is dense grove; balustraded wall bounds road on south side

(82) *Hungry Bay, B,* 1922—In pasture on southwest side of mouth of Hungry Bay, about 50 feet (15.2 meters) up slope from water, and about 30 feet (9.1 meters) from wire fence

(83) *Devonshire Church,* 1922—Between Old Devonshire Church and new church, on north edge of curved road joining them, southwest of group of four large cedars, opposite junction with intersecting road from south.

(84) *Devonshire Bay,* 1922—At head of bay, in north edge of roadway, along foot of steep embankment, about 50 meters west of old house.

(85) *Bowen Point, A,* 1922—North of Shelly Bay, west of race-track, south of east end of small cove, between two old quarry pits 10 paces apart, north one opening into cove and other into water on the west, 5 feet (1 52 meters) from north edge of latter

(86) *Bowen Point, B,* 1922—In west end of race-course, south of roadway leading east into the oval within course from point opposite breach in wall opening out to beach on Shelly Bay

(87) *Burchall Cove,* 1922—About 15 feet (4 6 meters) west of road between two cedars, about 100 meters east of 1907 station

(88) *Flatts Bridge,* 1922—North of bridge on east side of road, 4 paces north of footpath, 7 paces west of corner of old quarry

(89) *Spittal Pond,* 1922—North of Military Road, on hill above west end of pond, in cedar scrub, about 50 feet (15 2 meters) west of edge of planting-ground, about 60 feet (18 3 meters) east of stone "W D. 4," under cedar tree about 10 inches (25 cm) in diameter

(90) *Bailey's Bay,* 1922—South of North Shore Road, west of Bailey's Bay, about 150 feet (45 7 meters) west of Seaward, in roadway through stone wall entering grove on south side of road

(91) *Holy Trinity (Hamilton Parish) Church,* 1922—On west side of road, opposite west entrance to church, in semicircular space where carriages turn, declination and azimuth about 40 feet (12 2 meters) south, in edge of banana patch

(92) *Devil's Hole,* 1922—East of Devil's Hole, on east side of Tuckerstown road, 15 paces northwest of nearest corner of house, 5 paces from road, and 40 paces from sea-wall

(93) *Canton Point,* 1922—On north side of South Shore Road, where road runs close to bank above shore on south, and where there is high bank of hard limestone on north showing strata of high coloration at foot and at top of bank

(94) *Joyce's Cave,* 1922—On north side of road, behind clump of bushes to left of sign advertising Shakespeare's Tempest Cave, just west of deep sink-hole

(95) *Mangrove Lake,* 1922—On south edge of road to Devil's Hole, about one-fourth mile (0 4 km) west of Lake, under cedar tree on hill above banana field.

(96) *Shark Hole,* 1922—About 150 meters north of sharp turn of road at foot of hill at Shark Hole at corner of Harrington Sound, on low, flat point west of road, 12 paces west of coping by roadside, 4 paces from water's edge, and 5 paces west of a tree

(97) *Long Bird Island,* 1922—On west end of island, about one-quarter mile (0 4 km) east of end of island, about 200 feet (61 meters) west of point where road enters shallow rock-cut, on south side of road

(98) *Trott's Pond,* 1922—On Mid-Ocean Golf Course, north of pond where road branches, in clump of trees, on east side of road

(99) *Church Cave,* 1922—By courtesy of engineer-in-charge of improvements at Mid-Ocean Golf Course, at sea-level, in unimproved cave known as Church Cave

(100) *Church Cave Hill,* 1922—On hill, as nearly as possible directly over observation-point in cave, estimated difference in altitude about 125 feet (38 meters)

(101) *Tuckerstown,* 1922—In acute angle formed by two roads leading north and south respectively of Trott's Pond, about 160 feet (48 8 meters) west of stones marked "W D 99" and "W D 100," respectively

(102) *St George Hotel, A,* 1922—On hillside north of Hotel, under grove of small cedars

(103) *St George Hotel, B,* 1922—Northwest of station *A*, in clump of Pride-of-India trees, 40 feet (12 19 meters) north of corner post of tennis-courts, in south edge of roadway that meets roadway from hotel little further west, 8 feet (2 44 meters) from tree to west, and 16 feet (4 88 meters) from tree southeast

DESCRIPTIONS OF STATIONS

As stated in the previous volumes, one of the chief difficulties experienced by the observers of the Department of Terrestrial Magnetism, in the reoccupation of old stations for secular-variation data, has been the lack of necessary information to permit precise recovery of the point where the previous observations were made. Owing to the frequent occurrence of local disturbance, it may readily happen that erroneous secular-variation data will result from non-recovery of exact station. Accordingly, the observers of the Department are instructed to furnish as complete descriptions as possible of stations occupied, especially of such as give promise of future availability. Information additional to that contained in the published descriptions or copies of station-sketches or of photographs of surroundings will gladly be furnished those who are interested in the reoccupation of any of the stations.

The descriptions are given in alphabetical order under the same geographical divisions as adopted in the Table of Results. The general form followed in the descriptions is: Name of station, year when occupied, general location, detailed location, distances and references to surrounding objects, manner of marking, and finally the true bearings of prominent objects likely to be of permanent character. All bearings, unless specifically stated otherwise, are true ones, and are reckoned continuously from 0° to 360°, in the direction south, west, north, east. For some expeditions, owing to the absence of surrounding objects to which reference could be made and to the nature of the country traversed, the descriptions of stations naturally could not be made very full or precise, for some stations the data were necessarily so meager that worth-while descriptions could not be made up at all. When no mention is made of marking of station, it is to be understood that the station was either not marked at all or not in a permanent manner. For those stations which could properly be designated under more than one name, or which had several names locally, appropriate cross-references have been made.

When distances were measured originally in the English system, the conversions into the metric system are also given, but inclosed in parentheses, so as to show that they are converted figures. The following rules have been adopted in the conversions. Distances given to 0.1 foot are converted to the nearest 0.01 meter, 1 foot to the nearest 0.1 meter, estimated feet or yards to nearest meter, estimated fraction of a mile to nearest 0.1 kilometer, estimations of more than a mile to nearest kilometer. Short and important reference distances, when measured accurately, have been converted into nearest 0.1 centimeter, such measurements, however, as, for example, dimensions of marking-stones, etc., which are not of great importance, have been converted to the nearest centimeter. When a distance precedes a bearing, this is usually the observer's estimate of the distance from the station to the mark; such estimates naturally may be largely in error, but nevertheless will be of value in the future identification of the mark.

AFRICA

ABYSSINIA

Addis Abeba, British Legation, 1921—Close reoccupation of C I W station of 1914, on grounds of British legation, in large field known as "The Paddock," southeast of main drive of legation, 214 feet (65.2 meters) south of and exactly in line with northeast post of iron gate opening into field and ornament on quarters occupied by Oriental Secretary of Legation, and 202.2 feet (61.63 meters) southeast of fence along main drive, marked by stone block 10 by 12 by 20 inches (25 by 30 by 51 cm), its top face left about 1 inch (2.5 cm) above surface of ground, and lettered "C I W 1921" True bearings conical hill of range, 38° 30′.9, south edge of lodge, 200 meters, 71° 06′.1, north edge of lodge, 74° 48′.5, northeast post of gate in fence, 138° 36′.1, top of south gable of legation residence, 400 meters, 215° 41′.1, prominent mountain summit, 351° 39′.0

Addis Abeba, Catholic Mission, 1921—Exact reoccupation of C I W station of 1918, on land belonging to Roman Catholic Mission School for Girls, just inside entrance to school grounds, 25 meters south of gate, and 2.5 meters west of row of eucalyptus trees on east side of grounds, marked by a block of stone 6 by 12 by 18 inches (15 by 30 by 45 cm), its top face sunk level with surface of ground True bearings west side of east window of white residence, 800 feet (244 meters), 58° 39′.1, tall eucalyptus tree near residence, 59° 33′.0, bottom of west gate-post of mission, 25 meters, 217° 56′.5

Dire Daoua, 1921—Slightly south of C I W station of 1914, at west end of Dire Daoua, near hospital buildings, in open space southeast of hospital This site was covered with material for building True bearings prominent tree on plain, 2 kilometers, 112° 07′.3, southwest corner of stone building in southwest corner of hospital compound, 112° 46′.8, east spike on roof of nearby building, 100 meters, 186° 58′.9

Hawash, 1921—On level plain near C I W station of 1914, 175 paces northwest of and at right angles to railway line at a point 300 paces southwest of west corner of wall around Railway Hotel and 51 paces northeast of small isolated tree True bearings curve-marking pole on railway line, 0.4 kilometer, 27° 24′.0, top of highest peak of Mt Fantahli, 16 kilometers, 88° 06′.2, south edge of railway water-tank, 0.4 kilometer, 244° 21′.4

ALGERIA

Algiers, M, Algiers, 1922—As in 1912, intercomparison observations at the Bouzareah Observatoire d'Alger were made at the Moureaux station, designated *M*, on leveled space on hillside about 150 meters west of observatory grounds, and at station *O* in observatory grounds, marked by new peg True bearings ornament on equatorial coudé, 200 meters, 261° 26′.8, Dome de Kouba, 6 kilometers, 322° 46′.7, monument to African soldiers, 2 kilometers, 330° 26′.8

Oran, Oran, 1922—Practical reoccupation of C I W station of 1912, about 6 kilometers northeast of Oran, 54 feet (16.5 meters) south of south side of road forming southern boundary of new public park between main Oran road and cliff, about 200 feet (61 meters) east of edge of cliff, and in line with eastern edge of road running at right angles to southern boundary, marked by peg left 3 inches (8 cm) above ground, covered by cairn of stones True bearings east gable end of red-roofed cottage, about 1 kilometer, 3° 32′.2, east edge of cairn on near hill, 25° 15′.5, dome on Oran Cathedral, 53° 34′.9, tower of Santa Cruz Chapel on mountain near old port, 7 kilometers, 64° 48′.9, lighthouse on extreme headland, about 8 kilometers, 98° 02′.9, highest peak of mountain, about 12 kilometers, 248° 20′.4, base of sign-post at corner of main Oran road, about 200 meters, 287° 27′.7

Touggourt, 1922—Close reoccupation of C I W station of 1912, about 1 mile (1.6 km) north of north end of village, on top of barren roll of hard sand, 662 feet (202 meters) east of nearest point of caravan route to Biskra, north of sandstone quarry, marked by wooden peg left 5 centimeters above surface and covered with cairn of stones True bearings cross on east end of Catholic church in Touggourt, about 1 mile (1.6 km), 18° 18′.0, spire on tower of Arabic mosque in Touggourt, about 1.5 miles (2.4 km), 24° 32′.8, stone beacon on hill, about three-fourths mile (1 km), 92° 06′.4, north dome of Marabout of Zawit Imnuawar, about one-half mile (0.8 km), 218° 38′.8, Arabic mosque of Tebesbest, about three-fourths mile (1 km), 300° 45′.0

CAMEROUN

Garoua, 1926—Two stations were occupied Station *A* is a practical reoccupation of C I W station *A* of 1919, it is 60 meters northwest of north bank of Benue River, about 150 meters southwest of Niger Company's warehouse, about 100 meters west of river wharf, 48.0 meters south of old customs storehouse, and 40.0 meters south of nearest native hut at base of small knoll, marked by peg True bearings west gable of Niger Company's warehouse nearest wharf, 209° 55′.6, stone pier of wharf in Benue River at water's edge, 248° 36′.0, lone dead tree on south bank of Benue River, 321° 14′.2

Station *B* is a practical reoccupation of C I W station *B* of 1919, the pillar marking which has been destroyed It is near middle of military grounds, about 1.5 kilometer northwest of station *A*, north of native market square and west of road to river port, 24.5 meters east of east end of second barricade from south across training course, and 41.6 meters west of inner edge of race-track measured on line to small palm by road 51.3 meters distant, marked by sandstone and cement monument 50 by 50 centimeters on top set flush with surface, lettered "C I W 1926" with hole in center, a second monument 86.45 meters distant between race-track and road marks north end of meridian True bearings flagpole at government bureau, 100° 50′.5, west gable of government house on highest hill to northwest, 115° 15′.1, northeast corner of butcher shop, 304° 00′.3, northwest corner of long building at market, 326° 56′.3

EGYPT

Helwan, 1922—Observations for declination and horizontal intensity were made on the stone pier in the small wooden hut, designated *H*, of the Helwan magnetic observatory, and on the north pier in the porch or absolute room, designated *N*, inclination observations were made in the hut and on the south pier in the porch, designated *S*

Suez, Lower Egypt, 1922—Exact reoccupation of C I W station of 1908, 1911, 1914, and 1918, on low, boggy, salt-desert flat west of town of Suez, on embankment road leading southwest from town to Asiatic Petro-

AFRICA

EGYPT—*concluded*

Suez, Lower Egypt, 1922—continued
leum Company, north of road, and 116 meters north of small brick house at navigation beacon, marked by brass bolt set in cement in top of sandstone post 20 by 25 by 80 centimeters True bearings mosque in Arbain, 207° 39′ 4, mosque in Ibrahim Bey Gilidan, 213° 54′ 7, mosque of Abul-Eef, 238° 32′ 3, mosque in Port Tewfik, 311° 20′ 1, spire of Catholic church in Port Tewfik, 313° 13′.2

Tor, Sinai Peninsula, 1922—Practical reoccupation of C.I W stations of 1911 and 1918, near extreme point of curved sand-spit opposite village of Tor and northwest of quarantine station, about 100 feet (30 meters) north of temporary fisherman's hut True bearings most distant navigation beacon, about 1.5 miles (2 km), 6° 44′.8, mosque in northwest part of Tor, about 1 mile (1 6 km), 218° 03′ 4, mosque in southeast part of Tor, about 1 mile (1 6 km), 234° 52′ 4, flagpole on main quarantine building, about 1 mile (1 6 km), 285° 45′ 4.

FRENCH SOMALILAND

Jibuti (Djibouti), 1921—Exact reoccupation of C I W station of 1918, on sandy waste land north of Amboulı Gardens, 3 kilometers south-southwest of town of Djibouti, 54 meters east of center of road, measured from point 4 meters north of 3-kilometer post, and 52 meters east of this post, which is a portion of a steel "I" beam mounted in a square masonry base on east edge of road, about 150 paces north of northwest corner of Amboulı Gardens, where road turns to east, marked by a black stone, its upper face an acute triangle pointed northward, and projecting about 15 centimeters above ground True bearings top of lighthouse tower, 1 kilometer, 29° 49′ 6, flagstaff at residency, 4 kilometers, 201° 05′ 5, prominent mosque in town, 3 kilometers, 210° 26′ 3, eastmost wireless mast, 2 kilometers, 218° 15′ 4

FRENCH WEST AFRICA

Abidjan, Ivory Coast, 1926—A proximate reoccupation of C I W station of 1914, about 2 5 kilometers north of lagoon, about 1 kilometer east of railway station, and about 400 meters northeast of hotel, it is 33.5 meters north of center of road leading eastward from railway station past hotel, 4 meters east of center of first street east of hotel, marked by cement brick 20 by 20 by 51 centimeters set even with surface with cross marking center

Ansongo, French Soudan, 1926—A close reoccupation of C I W station of 1913, near center of level tract of clay soil, about 100 meters southeast of commander's residence, about 100 meters northeast of post- and telegraph-office, about 150 meters northeast of market, and about 190 meters west of barracks for Senegalese soldiers; it is 31 4 meters, 28 0 meters, and 36 2 meters from thorn trees to southwest, west, and north respectively, marked by large irregular sandstone projecting 10 centimeters above surface, having small indentation in top to mark center True bearings steel telegraph-pole standing against east side of post- and telegraph building, 61° 31′ 1, steel telegraph-pole to north about 250 meters, 173° 20′.8

Bouaké, Ivory Coast, 1926—Two stations were occupied Station *A* is about 2 5 kilometers northeast of railroad station, about 50 meters east of gate into compound inclosing officers' quarters at military camp, 3 meters east of native foot-path, 19.5 meters north of

AFRICA

FRENCH WEST AFRICA—*continued*

Bouaké, Ivory Coast, 1926—continued
center of road leading into camp, and 10 0 meters west of center of road to Bouaké, marked by concrete monument 40 by 40 by 80 centimeters lettered "A-C.I W 1926" set with top about 20 centimeters above surface True bearings station *B*, 250 meters, 22° 21′.5, telegraph-pole in front of Military Bureau, 39° 00′.3, northwest corner of mud soldier barracks, 297° 43′ 4

Station *B* is about 250 meters southwest of station *A*, 29 0 meters southeast of center of road to Bouaké, 1 meter south of center of native path to huts of black soldiers, in line with fence southwest side of military compound, marked by concrete monument 40 by 40 by 80 centimeters lettered "B-C I W 1926" set with top about 15 centimeters above surface True bearings base of flagpole in compound, 150° 59′ 8; station *A*, 202° 21′.5, tip on black soldiers' round mud hut No 2, 228° 03′ 2

Bourem, French Soudan, 1926—A proximate reoccupation of C I W station of 1913, on north bank of the Niger River, about 11 meters north of water's edge, about 200 meters east of river port, about 100 meters southeast of administrator's residence, about 800 meters southwest of fort, 6 7 meters south and 10 4 meters west of thorn hedge which forms right angle east of station, marked by cross in native brick 15 by 30 by 50 centimeters True bearings steel telegraph-pole, 179° 06′ 0, flag on fort, three-fourths kilometer, 220° 31′ 6, northwest corner of new building, about three-fourths kilometer, 264° 00′ 6

Conakry, French Guinea, 1925—Two stations were occupied Station *A* is 6 04 meters north of C.I W station of 1914, exact reoccupation being prevented by the erection of a concrete building whose north wall stands about 15 centimeters from the point, on west side of Boulevard Maritime opposite steps to Treasury, 6 40 meters from northwest corner, and 6 71 meters from northeast corner of concrete house, and 13 05 meters west of curb along boulevard measured on line tangent to south side of palm tree near curb, marked by peg True bearing triangulation monument on west side of boulevard, 199° 02′ 7

Station *B* is west of Boulevard Maritime, about two-thirds kilometer south of station *A*, nearly in extended line of north curb of Second Avenue, northeast of concrete house, and about 4 meters from bank above rocky shore, it is 10 4 meters from end of curb on west side of boulevard and 9 35 meters from coconut palm near end of curb, 3.8 meters south of palm near shore and 14 0 meters northwest of palm near west edge of boulevard, marked by cement post 20 by 20 by 70 centimeters extending 10 centimeters above surface and marked "C I W 1925" True bearings triangular marker monument on most northerly point of island, 96° 07′ 4; southwest edge of small concrete building between boulevard and sea, 190° 21′ 1

Cotonou, Dahomey, 1926—Two stations were occupied Station *A* is a close reoccupation of C.I W station of 1913, north of road to Ouidah, about 125 meters west of 1-kilometer stone and about 120 meters east of concrete aqueduct crossing Ouidah road, 400 meters southwest of railroad repair shops, 47 5 meters west of center of road to Transition Depot de Dahomey, 16.2 meters north of Ouidah road, measured along line past coconut palm 9 8 meters distant, marked by cement brick 15 by 25 by 60 centi-

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FRENCH WEST AFRICA—*continued*

Cotonou, Dahomey, 1926—continued
meters lettered "C I W" with cross marking exact point and set slightly above surface True bearings tip on native hut among soldiers' barracks (Transition Depot de Dahomey), 175° 31′ 4, flagpole at bureau compound of Transition Depot de Dahomey, 193° 02′ 5

Station *B* is on southwest corner of property belonging to John Holt Company, south of Ouidah road, about opposite stone one-half kilometer marker west of town, 65 meters south of center of Ouidah road, 6 5 meters east of tree in southeast corner of grove of fir trees, and 9 4 meters from next tree north True bearings flagpole on building of John Holt Company, 257° 17′ 9, flagpole on end of pier in harbor, 288° 11′ 5

Dakar, Senegal, 1925—Two stations *A* and *B* were occupied Station *A* is about 200 yards (183 meters) southwest of C I W station of 1912, 1913, latter being no longer desirable on account of presence of magnetic material It is north of town, about 1 8 kilometers east of electric power-house, on point of land known as Bel-Air, 16 feet (4 9 meters) east of hedge around field, 30 feet (9 1 meters) north of center of deep unused road and 43 3 feet (13 20 meters) north of small iron pin in center of cement marker on south side of old road, marked by stone 5 by 5 by 24 inches (13 by 13 by 61 cm), set with surface about 2 inches (5 cm) above ground, cross in top marking exact point True bearings flagpole on dome of governor-general's palace, 11° 09′.2, top of wireless mast, 26° 57′ 7, point on smoke-stack seen through opening in bush hedge, 162° 15′ 3, signal light on end of mole in harbor, 345° 24′ 2

Station *B* is on point of land known as Bel-Air, about 0 6 kilometer west of station *A* and about 1 kilometer northeast of electric power-house, about 200 meters northwest of small battery, about 100 meters northwest of by-road leading to small battery, in an old field surrounded by a bush hedge southeast of a large sand dune, 6 6 feet (2 01 meters) west of path through field, 56 feet (17 1 meters) west of east hedge, 54 feet (16.5 meters) south of north hedge, and 59 1 feet (18 01 meters) south of tree in northeast corner of field, marked by a quart bottle buried flush with ground True bearings flagpole on governor-general's palace, 4° 40′ 8, top of wireless mast, 21° 46′ 9, tip on signal lighthouse on mole in harbor, 332° 40′ 0

Gaya, Niger, 1926—Two stations were occupied Station *A* is about one-fourth mile (0 4 km) north of Niger River, on level sandy spot north of government compound, 33 95 meters and 48 15 meters from northeast and northwest corners of compound wall respectively, and 22 25 meters north of northwest corner of kitchen where it joins compound wall, marked by native sandstone set in mud mortar flush with surface and lettered "C I W 1926," with cross marking center True bearings flagpole on cliff in front of commander's residence, 87° 38′ 4, northwest corner of market building, 269° 22′ 0, flagpole on east entrance gate to government compound, 324° 47′ 7

Station *B* is a proximate reoccupation of C I W station of 1913, north of Niger River, about 150 meters southeast of government compound, and about 125 meters southwest of post- and telegraph-office, 12 9 meters southwest of center of raised road, 9 85 meters southwest of tree at roadside, 13 85 meters south of tree on near side of ditch, 16 50 meters from lone tree to southeast, marked by cross in large flat sand-

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FRENCH WEST AFRICA—*continued*

Gaya, Niger, 1926—continued
stone set flush with surface True bearings flagpole on cliff edge near commander's residence, 107° 41′ 6, flagpole on east entrance gate to government compound, 146° 45′ 1, tip on native hut on right side of road, 309° 40′ 7

Grand Bassam, Ivory Coast, 1926—Two stations were occupied Station *A* is on north side of lagoon, about 400 meters east of narrow-gage railroad bridge, across lagoon from pier of Chargeurs Réunis, between two small inlets, 11 5 meters north of native foot-path, 26 5 meters west of west corner of foot-bridge leading to native village, and 23 meters east of small palm tree, marked by concrete monument 15 by 15 by 22 inches (38 by 38 by 56 cm) lettered "A-C I W 1926" set with top about 3 inches (8 cm) above surface True bearings front gable on C G M A, 10° 14′ 2, gable on lawyer M Clement's office, 65° 39′ 4, lighthouse, 177° 26′ 6

Station *B* is south of lagoon, about 400 meters west of highway bridge, in northward extension of property line along street passing office of I T Williams and Sons, 200 meters beyond school building, 16 0 meters northwest and 28 2 meters southwest of corners of concrete tennis court, marked by peg True bearings telephone-pole in center of concrete lagoon bridge, 262° 46′ 0, west gable of adjutant's house, 345° 30′ 4

Kayes, French Soudan, 1925—Two stations, *A* and *B*, were occupied Station *A* is in division known as Kayes-Ville, and is a close reoccupation of C I W station of 1913, the portion of the bank where the latter was located having been carried away by the stream It is 10 feet (3 0 meters) from bank of Senegal River, east of Ballay Avenue, about 0 5 kilometer east of administration buildings, nearly in line of center of Rue du Lieutenant Carnier intersecting Ballay Avenue, 58 2 feet (17 74 meters) northeast of sea-wall, marked by peg True bearings stone post in corner of stone fence around orphanage on Ballay Avenue, 108° 06′ 8, peak of gable of large house across Senegal River, 123° 28′ 2, north edge of lone square concrete hut among round straw huts across river, 264° 37′ 0

Station *B* is in division known as Kayes-Plateau about one-half mile (0 8 km) southwest of Station *A*, about midway between the Palais du Government and the Maison du Fonctionnaires, 2 1 meters northwest of center of native path, 13 05 meters, 8 05 meters, and 13 35 meters from centers of three trees on opposite side of path to northeast, east, and southeast respectively, 19 25 meters east of nearest of group of seven locust trees, and 11 4 meters southeast of a lone tree, marked by peg True bearings base of support of light on west pillar at entrance to palace grounds, 130° 41′ 8, top north corner of northmost railroad barracks seen between trees east of path, 0 7 kilometer, 297° 38′ 7, south top corner of southmost railroad barracks, 0 7 kilometer, 310° 35′ 3

Koulikoro, French Soudan, 1926—Two stations were occupied Station *A* is about 700 meters north of railroad, on hill north of two large stone hotel buildings, 20 meters northwest of intersection of road from depot and road to commandant's residence, 17 65 meters from tree near road, 8 8 meters east of large tree, marked by small round hole in top of stone 75 by 75 centimeters, extending 75 centimeters above the ground, with the letters "S L" on upper face, this stone being third of a row of granite and cement markers extending from the commandant's residence

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FRENCH WEST AFRICA—*continued*

Koulikoro, French Soudan, 1926—continued
parallel with road, the second of row being 27 10 meters northwest True bearings outside edge of northeast corner post of red brick wall, 32° 23′ 1, southwest edge of large stone pillar at west end of gate at entrance to commandant's residence, 220° 17′ 3, southeast edge at top of stone hotel, 347° 00′ 1

Station *B* is an exact reoccupation of C.I W station of 1913, on the north side of the Niger River, on a ledge of solid rock on first terrace below commandant's house, 18.2 meters from center of road leading up-hill, 5 7 meters from lower edge of rock ledge, and about 60 meters northeast of telegraph line, marked by a cross in top of granite post 20 centimeters square set in concrete bed, the edge being lettered "Point Astronomique 1905" True bearings base of flagpole on stone hotel, 55° 41′.2, base of flagpole on wall of French commandant's residence, 142° 21′ 6, south tip of steel-roofed building along river, 351° 39′ 4

Kouroussa, French Guinea, 1926—About 1.25 kilometers east of railroad station and about 1 kilometer south of railroad bridge over the Niger River, 250 meters west of river bank, in open plaza east of the French commandant's residence, and west of administrateur's residence It is in line defined by six medium-sized trees, 18 05 meters southwest of southwest tree of row, 22.0 meters northwest of nearer of two large trees 11 meters apart, and a group of small newly planted trees are distributed around the station, 4 8 meters to northeast, 10 1 meters to southeast, 6 68 meters to southwest, and 10 7 meters to northwest, respectively, marked by peg to be replaced by cement pillar True bearings front tip of gable on commandant's residence, 72° 46′.2, tip of gable in most northern large tin building to northwest (engine house), 146° 26′ 6, southwest corner of administrateur's residence, 242° 27′ 1

Mamou, French Guinea, 1925—Two stations were occupied Station *A* is a practical reoccupation of C.I W station of 1912, about 1 kilometer south of railroad and about 200 meters north of old hospital, 19 0 meters west of path to hospital, 21 0 meters and 28 5 meters respectively from two trees to northeast and east, marked by peg True bearings northwest corner of ruins of old hospital wall, 13° 05′ 2, northeast gable of railroad station, 185° 42′ 7, pinnacle on most easterly railroad building, 229° 36′ 7

Station *B* is about three-fourths kilometer north of railroad in European section of town, about one-fourth kilometer north of Administrateur's Bureau, within acute intersection of a narrow road bearing northeastward with wide road leading up-hill, 7 08 meters south of papaw tree, 7 7 meters southwest of large tree west of narrow road, and 9 5 meters northwest of large tree on farther side of narrow road True bearings west gable of tin roof of large store, 9° 33′.9, tip on hut on mountain across railroad, 10° 54′ 8, tip on very large hut, 173° 32′ 0

Matam, Senegal, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1913, on west bank of Niger River, 133 0 feet (40 54 meters) north of brick and concrete monument marking lot corner, 39 0 feet (11.89 meters) west of center of Rue de la Poste, and 272.2 feet (82 97 meters) southeast of southeast corner of new residence of M la Coue, a fonctionnaire; marked by cross in top of brick and concrete monument 20 by 20 inches (51 by 51 cm) extending 5 inches (13 cm) above ground True bearings fourth steel telegraph-pole, counting west from post- and telegraph-office, 103° 13′ 1, southeast corner of large two-story building on Rue de la Poste, 164° 02′ 6

Station *B* is about one-fourth mile (0 4 km) south of main part of town, about one-third mile (0 5 km) southwest of *A*, over a brick and concrete monument marking street corner on south side of wide road south of administrative grounds, and about 150 yards (137 meters) west of intersection of this road with Rue de la Poste It is 19 88 meters west of monument marking corner of grounds of the fonctionnaires, 29 95 meters from monument on street line running south, and 35 95 meters north of center of large tree, marked by cross in top of brick and concrete monument 8 by 8 inches (20 by 20 cm) projecting 10 inches (25 cm) above ground True bearings top of leaning steel telephone-pole, about 400 yards (366 meters), 88° 09′.2, south gable of administrateur's building, 185° 31′ 1, gable of two-story house, 320° 08′ 1

Mopti, French Soudan, 1926—Two stations were occupied Station *A* is about 300 meters north of C I W. station of 1913, on the right bank of Bani River, on southwest end of strip of land between raised road from commandant's residence to Mopti and river, 6 70 meters east of edge of river bank, 13 4 meters west of fourth tree on east side of raised road south from intersection of road with by-road, and 11.5 meters southwest of first tree from south on west side of raised road, marked by roughly constructed cement pillar placed flush with surface of ground, lettered "C I W 1926," with cross in top marking center True bearings pinnacle on southwest corner of mud house near commandant's residence, 201° 58′ 7; station *B*, 202° 15′ 6, flagpole on military headquarters in town, 334° 56′ 7

Station *B* is about 150 meters northeast of station *A*, on the right bank of Bani River on strip of land between river and road parallel to river running from commandant's residence to village, about midway between the two places, almost north of intersection of a by-road with main road, 17 8 meters west of center of road, measured from a point midway between fourth and fifth trees west of road and north of road intersection, 15 5 meters and 16 3 meters from these trees respectively, and 3.3 meters from river bank True bearings pinnacle on southwest corner of mud house near commandant's residence, 201° 55′ 9, flagpole on military headquarters in town, 352° 32′.3

Niafunké, French Soudan, 1926—A close reoccupation C I W station of 1913, in the yard at rear of French commandant's residence, 5 0 feet (1 52 meters) north-east of northeast corner of astronomic pier of 1911, 40 0 feet (12 19 meters) northeast of main part of commandant's residence measured along line tangent to mud railing of rear steps and passing 2 0 feet (0 61 meter) east of astronomic pier

Niamey, Niger, 1926—Two stations were occupied Station *A* is about 75 meters south of C.I W station of 1913, on summit of bluff overlooking Niger River, about 350 meters south of Bureau of Subdivision building, about 130 meters southeast of French residence, and about 150 meters northwest of small building used as garage, 28 4 meters southwest of center of driveway to garage, in a break in line of acacia trees parallel to driveway, 6 5 meters and 4 5 meters from nearest tree to northwest and southeast respectively, station is to be marked by local authorities by a cement pillar True bearings. flagpole on French residence to northwest, 122° 07′ 1, flagpole

AFRICA

FRENCH WEST AFRICA—*continued*

Niamey, Niger, 1926—continued on Bureau of Subdivision to north about 350 meters, 174° 00′ 9, east edge of pillar near east end of wall around cliff edge, 346° 30′ 5

Station *B* is on top of plateau on east bank of Niger River, 24 3 meters south of center of road to Zinder, about one-fourth kilometer east of Bureau of Subdivision building, nearly in line with the east side of large white building used as travelers' quarters and 18 3 meters south of small tree near roadside True bearings flagpole on Bureau of Subdivision building, 83° 05′ 2, tip of first hut among soldiers' barracks, 170° 02′ 2, tip of post at southwest corner of cemetery wall, 311° 04′ 8

Parakou, Dahomey, 1926—A close reoccupation of C I W station of 1913 in angle bounded on north by road to Nikki and on west by road to Savé, about 200 meters southeast of French residence, and about 50 meters northeast of post-office, 38 25 meters east of northeast corner of school building, 20 0 meters south of road to Nikki, measured along line through small mango tree at roadside 11 35 meters distant, and 13 9 meters southeast of large mango tree True bearings edge of east gate-post at entrance to French residence, 115° 07′ 6, northeast edge of government store and school building on north side of Nikki road, 161° 16′ 0

Podor, Senegal, 1925—Two stations, *A* and *B,* were occupied Station *A* is probably 10 or 15 meters southwest of de Vanssay's station of 1895, near the northwest corner of a street intersection, southwest of fort, 4 95 meters northeast of brick monument marking street line and lot corner and over which C I W observations were made in 1913 (an exact reoccupation being prevented by erection of a mud wall), it is 9 9 meters west of mud fence between military grounds and street, and 25 50 meters northwest of brick and cement monument marking northeast corner of street intersection, marked by peg True bearings flag support on south top edge of main building at fort, 210° 08′ 1, northeast corner of building of Colonial Transit Company at water-front, 298° 07′ 2, pinnacle on red-tile roof of building of Oldani Merchants on water-front, 317° 20′ 6

Station *B* about 1 kilometer southwest of main village and station *A,* about one-fourth kilometer southeast of residence of commandant, and about 40 meters east of hospital compound near bank of river, 10 5 meters southwest of nearer of two trees, 15 7 meters west of tree near river bank, and 8 0 meters from tree to south, marked by quart bottle placed mouth up flush with surface True bearings southwest corner of small kitchen south of doctor's office, 79° 18′ 1, north pinnacle of two on commandant's residence, 135° 52′ 0

St Louis, Mauretania and Senegal, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1912, about 2 kilometers north of main bridge connecting Senegal and Mauretania, on west side of Little Senegal River in Mauretania, about 1 kilometer north of military hospital, about one-half kilometer southeast of rifle range, about one-fourth kilometer southeast of foundations of two houses near palm grove, it is 68 meters west of river bank, 9 35 meters north of a concrete marker, 8 0 meters southeast of nearest of four bunches of cactus, marked by peg True bearings west edge at top of tall brick smokestack on point extending into river, 227° 08′.2, spire of church on Sohr Island, 324° 13′ 0, flagpole on lighthouse, 355° 57′ 0

AFRICA

FRENCH WEST AFRICA—*continued*

St Louis, Mauretania and Senegal, 1925—continued

Station *B* is in Senegal, on east side of Big Senegal River, on Sohr Island, in center of first large open space northeast along river from big bridge, bounded on east and south by large marigot, about 200 meters north of walled cemetery, roughly in line approximately parallel with river bank joining two cement markers, being 25 65 meters southwest and 6 95 meters northeast of these markers respectively, it is 25 55 meters southeast of a third marker and 1 4 meters southwest of native path, marked by a quart bottle buried mouth up flush with surface True bearings west edge at top of tall brick smokestack on point extending into river, 164° 09′ 6, spire on church on Sohr Island, 357° 50′ 9

Savé, Dahomey, 1926—A practical reoccupation of C I W station of 1913, about 100 meters south of French residence in line with west end of building, 14 5 meters west of center of shaded walk running southward from residence, about 40 meters east of north-south road to Sabarou, 10 00 meters southwest of fourth tree on west side of shaded walk counting from residence, and 12 45 meters northwest of fifth tree, marked by rough granite stone with cross in top and extending 50 centimeters above surface True bearings southwest edge near top of French residence, 166° 23′ 4, northwest edge of small granite stone building used as store and about 100 meters to northeast, 216° 10′ 9

Segou, French Soudan, 1926—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1913, up river from boat-landing between Hotel de Passage and river, 10 0 meters north from mud fence around hotel, 74 0 meters southwest of upper end of river gage, and southwest from pillar "Service Geographique Mission Astronomique" marked by cross in top of native stone 20 by 15 by 40 centimeters placed in center of concrete block 1 by 1 meter flush with ground True bearings tall steel tower across Niger River, 1 5 miles (2 4 km), 224° 24′.2, station *B,* 239° 17′ 5, flagpole on building of Deves-Chaumet nearest river, 239° 28′ 6

Station *B* is on the south bank of the Niger River, about 350 meters east of station *A,* northeast of the French commandant's residence, 4 5 meters from water's edge, 18 45 meters northwest of nearer of two large trees east of wide native path, 30 3 meters northeast of northeast corner of large stone wall extending from commandant's residence to river, marked by native brick 10 by 15 by 30 centimeters flush with surface with cross marking point True bearings station *A,* 59° 17′ 5; tall tree on opposite bank of Niger River, 142° 25′ 9, steel tower on rock pier on opposite side of river, 223° 49′ 4

Tambacounda, Senegal, 1925—About one-third mile (0 5 kilometer) northeast of railroad station, on summit of hill, on west side of main road to Gambia, opposite administrator's palace, over cement pillar marking north side of intersection of street from west, 16 5 meters west of wall of palace yard, 20 95 meters northwest of southwest corner of large pillar north of entrance gate, marked by cement pillar, 11 by 11 centimeters, extending 11 centimeters above ground, being the north pillar of two 30 meters apart, set by road surveyors to mark the street intersection True bearings northmost of four small spires on railroad buildings, 29° 27′ 6, northwest corner of adjutant's residence, 188° 02′ 5, east spire of two on administrator's palace, 277° 20′ 2

Timbuktu, French Soudan, 1926—Two stations were occupied Station *A* is north of circular garden in

AFRICA

FRENCH WEST AFRICA—*concluded*

Timbuktu, French Soudan, 1926—continued
government square, south of government palace, about midway between two small trees, 17 8 feet (5 42 meters) and 23 3 feet (7 10 meters) from tree to southwest and northeast respectively, 97 4 feet (29 70 meters) south of southwest corner of mud wall around government palace, 84 6 feet (25 79 meters) southeast of southeast corner of wall around post-office, and 54 8 feet (16 70 meters) north of pillar in wall around circular garden, marked by brick and cement pillar buried somewhat below surface, lettered "C I W 1926" with cross marking center True bearings post on southwest corner of Fort Bonnier, 8° 34' 4, pinnacle of old mosque, 114° 50' 4, flagpole on Poste de Police, 303° 51' 4, telegraph-post in center of street 357° 29' 9

Station *B* is a practical reoccupation of C I W station of 1913, about 100 meters west of commander's residence, 14 0 feet (4 27 meters) south of center of astronomic pillar and 23 feet (7 01 meters) southwest of monument to Lieutenant Bonnier True bearings west corner of top of large lone building, 5° 40' 4, pinnacle on old Moorish mosque, 228° 41' 4, post on northwest corner of Fort Bonnier, 302° 37' 6

GOLD COAST COLONY

Accra, 1926—Three stations were occupied Station *A* is a close reoccupation of the C I W station of 1914, on golf-links, midway between the seashore and the main road to Christiansborg, 175 meters southwest of second bungalow from the cross-roads, 18 5 meters west of road leading from main road to seashore, and 8 5 meters south of tee No 8 of golf-course, marked by concrete pillar 20 by 20 by 75 centimeters inscribed "C I W 1926" True bearings tip on lighthouse, 50° 23' 5, spire on Church of England, 64° 42' 4, flagpole on Secretariat, 110° 53' 3; peg at station *B*, 122° 40' 1

Station *B* is a close reoccupation of C I W station of 1919, on the Victorian golf-course just north of the ninth fairway, in line with fence on east side of Public Works Department offices, 70 5 meters southeast of the southeast fence corner and across the main road to Christiansborg from these offices, and 24 15 meters south of the southwest edge of concrete base of rainfall gage, marked by concrete pillar 20 by 20 by 75 centimeters inscribed "C I W 1926" True bearings dome of lighthouse, 43° 05' 2, spire on Church of England, 50° 55' 2, dome on post-office building, 61° 25' 2

Station *C* is about 3 5 miles (5 63 km) northeast of Accra on West Ridge at military cantonments, 300 meters west of officers' mess house, 75 meters south of governor's lodge, and 45 meters south of Circle Road to cantonments It is 28 60 meters south-southwest of cement pillar marking governor's lodge triangulation point of the Gold Coast Survey and in line with this pillar and spire on Basel (now Scottish Mission) church in Christiansborg, and 8 35 meters northwest of small cement property beacon, to be marked by cement pillar True bearing of Scottish Mission church spire as furnished by Gold Coast Survey, 21° 44' 6

Kumasi 1926—Two stations were occupied Station *A* is about 50 feet (15 2 meters) south of C I W station of 1914, on ridge in European section, about 1 mile (1 6 km) south of central part of town, on northeast edge of polo-grounds in line between two Gold Coast Survey monuments, 24 50 meters south of monument or northeast edge of polo-grounds, marked

AFRICA

GOLD COAST COLONY—*concluded*

Kumasi, 1926—continued
"GCS CTS2," and 175 meters north of monument on southwest edge of grounds, marked "GCS CTS-135," 25 6 meters and 28 7 meters respectively southwest of two royal palms near edge of grounds, marked by Gold Coast Survey monument 8 by 9 by 12 inches (20 by 23 by 30 cm) marked "GCS CSI" set with top 10 inches (25 cm) beneath surface of ground True bearings flagpole at bungalow of chief commissioner of Ashanti, 40° 06' 8, flagpole in front of old fort, 181° 52' 6, cross on Basel Mission church in Kumasi, 200° 22' 4

Station *B* is about one-third mile (0 5 km) northwest of *A* near southeast end of proposed polo-ground, 8 8 meters northwest of boundary of lot between bungalow of chief justice and that of district commissioner, 24 4 meters northeast of large tree at north corner of commissioner's lot, and 40 8 meters west of northwest corner of servant's house on chief justice's lot, marked by cross in top of concrete block 4 by 8 by 20 inches (10 by 20 by 51 cm) set with top 4 inches (10 cm) above surface True bearings left edge of provincial commissioner's house, 69° 49' 4, steel telephone-pole on north-west end of proposed polo-ground, 113° 32' 2, left edge of servant's house, 237° 16' 8

Sekondi, 1926—About 2 miles (3 2 km) northeast of Sekondi, northwest of road to Chamah, on property belonging to Dr Marsters, one-half mile (0 8 km) east of Nyiasia, at top of round knoll, 27 6 meters east of southeast corner and 30 0 meters northeast of southwest corner of bungalow occupied by Mr Courtiss, marked by concrete monument 8 by 8 by 24 inches (20 by 20 by 61 cm) lettered "C I W 1926" set with top about 2 inches (5 cm) above surface True bearings flagpole on old fort in Sekondi, 17° 43' 1, flagpole of West African Lighterage, 23° 41' 0, southeast corner of bungalow of Mr Courtiss, 108° 01' 0

KENYA COLONY

(Note Earlier occupations of repeat stations in this section were listed under British East Africa, in Volume I of this series)

Kisumu, 1921—About 100 feet (30 meters) southeast of C I W station Port Florence of 1909, east of railway station, 250 yards (229 meters) southeast of cotton ginnery, in range with its northeast end and highest point of a ridge to northwest, 196 2 feet (59 80 meters) north of southeast veranda-post of Indian store, 153 4 feet (46 76 meters) east of nearest telegraph-pole and 41 paces from road to southeast True bearings bottom of east veranda-post of Indian store, 19° 54' 6, northeast end of roof of cotton ginnery, 139° 33' 3, prominent tree across gulf, 3 miles (5 km), 162° 55' 8, top of prominent rock at east end of range, 236° 54' 3, front gable of Indian store, 287° 24' 3

Makindu, 1921—Close reoccupation of C I W station of 1909, in thick thorn scrub about 100 yards (91 meters) southwest of new railway residences, 410 yards (375 meters) southwest of railway station, on prolongation of short roadway leading directly from station building True bearings prominent tree, 3 miles (5 km), 145° 56', top east edge of railway water-tank, one-fourth mile (0 4 km), 219° 17' 5 west spike on roof of northmost of two red-roofed residences, 600 feet (183 meters), 228° 45' 7 large rock on summit of saddle-backed hill, 304° 28'

AFRICA

KENYA COLONY—*concluded*

Mombasa, 1921—About 150 feet (45 7 meters) southwest of English Point, Mombasa, C I W station of 1909, 9 paces north of point in path 250 paces northeast of English Point, and 27 paces beyond point where light railway crosses path, marked by concrete block 12 inches (0 3 meter) square, and standing about 2 feet (0 6 meter) above surface, its top face lettered "C I W 1921" True bearings top of east corner of wall of old fort, one-half mile (0 8 km), 16° 17′ 6, top of Vasco da Gama monument, one-half mile (0 8 km), 28° 08′ 8, northmost of two wireless masts, 2 miles (3 km), 95° 12′ 9, ornamental urn on southeast corner of high-school, 133° 09′ 0, coconut palm in direction of navigation mark, 47 feet (14 3 meters), 152° 44′

Nairobi, 1921—Two stations were occupied Station *A* is probably about 30 yards (27 4 meters) south of the C I W station of 1909, southeast of railway station, 82 paces east of road, and 150 feet southeast of corner pole of transmission line

Station *B* is on open grassy land between Whitehouse Road and Fifth Avenue, about one-fourth mile (0 4 km) southwest of general post-office, 203 paces southeast of Treasury and 37 paces southwest of water channel, marked by a concrete pillar 4 feet (1 2 meters) high, 18 inches (46 cm) at base and 9 inches (23 cm) at top, lettered "C I W 1921," erected by Land Survey Department True bearings bottom of northeast concrete pillar of Secretariat buildings, 22° 24′ 5, cross on west end of church, 95° 04′ 0, tip of roof of Treasury building, 153° 43′ 5, east gable of Scotch church one-half mile (0 8 km), 169° 56′ 1, top of post-office clock-tower, 205° 48′ 4, top of church-steeple, one-fourth mile (0 4 km), 244° 34′ 4

Nakuru, 1921—Near the C I W station of 1909, north of railway, opposite east end of station house, and 350 yards (320 meters) north of site of former fence inclosing station and sidings True bearings top of church-steeple, 900 feet (274 meters), 44° 35′ 3 lone tree on sky-line, 5 miles (8 km), 98° 12′ 6, flat peak on ridge, 15 miles (24 km), 290° 28′ 6, geodetic beacon on hill, 5 miles (8 km), 314° 22′ 7, spike on front gable of eastmost railway residence, 600 feet (183 meters), 354° 13′ 1

Port Florence, 1921—See Kisumu

Voi, 1921—Close reoccupation of C I W station of 1909, on grassy flat southeast of railway inclosure, 117 paces northeast of junction of two paths 90 paces north of river bank and 300 paces southeast of railway along path toward river which crosses tracks 106 paces east of railway inclosure True bearings bottom of cliff-like hill, 15 miles (24 km), 76° 05′ 6, southmost pillar of water-tank, one-fourth mile (0 4 km), 79° 58′ 8, northeast corner of flat roof of railway rest-house, one-fourth mile (0 4 km), 91° 19′ 8, flagstaff at government station, 1 mile (1 6 km), 113° 16′ 5, south end of roof of railway native quarters, 127° 20′ 2, rocky summit of highest hill, 3 miles (5 km), 167° 56′

LIBERIA

Bushrod Island (Monrovia), Montserrado, 1923—On Bushrod Island 5 kilometers north of Monrovia 2 25 kilometers southeast of mouth of St Paul River, 100 meters southeast of Parini Farm, and 100 meters from high-water mark on the beach, marked by empty 30 caliber cartridge shell sunk in top of concrete block 24 by 30 by 80 centimeters,

AFRICA

LIBERIA—*continued*

Bushrod Island (Monrovia), Montserrado, 1923—cont'd lettered "C I W 1923" and set in an irregular mass of concrete about 1 cubic meter in volume buried flush with ground The station is identical with a primary control station of the Boundary Survey designated as "MAG" True bearings monument in Monrovia, 5 kilometers, 15° 53′ 7, south mast French wireless, 6 kilometers, 16° 36′ 1, spire in Monrovia, 17° 45′ 4, conspicuous palm tree, 1 6 kilometers, 151° 49′

Cape Palmas, Maryland County, 1926—Because of the large local disturbance known to exist in the vicinity of Cape Palmas, several stations were occupied These are station *A* on Russwurm Island, station *B*, immediately across channel from *A*, station *C*, west of *B* in vicinity of lighthouse, and Harper, on north side of Hoffman River Two stations were also established at Cuttington, about 8 miles (13 km) northeast of Harper See separate descriptions of Cuttington and Harper

Station *A*, on Russwurm Island, is a close reoccupation of C I W stations of 1914 and 1919, on level space on top of rocky ridge, about midway between east end of island and its highest point, about 6 meters north of barren rocks of south side of island and 2 meters south of dense vines and bush on north side of island, marked by rough stone about 18 by 22 by 14 inches (46 by 56 by 36 cm) extending about 8 inches (20 cm) above surface, lettered "C I W" with cross marking center True bearings tip on lighthouse, 129° 24′ 6, flagpole on front of Elder Dempster's bungalow and office, 173° 52′ 2, north spire of two on Protestant Episcopal church, 234° 47′ 9, south spire on Protestant Episcopal church, 235° 05′ 6

Station *B* is near the shore opposite station on Russwurm Island, 10 meters southwest of fresh-water spring, on grassy spot surrounded by solid rocks, 2 4 meters, 1 2 meters, and 1 7 meters from rock to east, south, and west respectively, about 25 meters east of small sandy beach and south of south end of old rock wall in rear of homes of two Liberians across street from Elder Dempster's bungalow, marked by peg True bearings sharp pointed pinnacle-shaped stone on west end of Russwurm Island, 40° 27′ 0, split between two huge rocks on east end of Russwurm Island, 348° 38′ 4

Station *C* is about 100 meters southwest of lighthouse near extremity of cape about 15 meters north of edge of rock on shore of channel near edge of grassy plot, 3 meters and 5 meters from young oil palms southwest and southeast respectively, marked by peg True bearings pinnacle-shaped rock on west end of Russwurm Island, 4° 15′ 6, tip on lighthouse 215° 44′ 6, southeast corner of girls' mission school, 241° 35′ 0

Cuttington, Maryland County 1926—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1919, on grounds of Cuttington College, 68 0 meters south of southwest corner of Epiphany Hall, 20 1 meters southwest of southwest corner of president's cottage, east of path passing front of Epiphany Hall, 10 1 meters north of center of middle one of three large mango trees, marked by rough flat native stone set even with surface, lettered on top "C I W" with cross marking center True bearings split in center of middle of three large mango trees to south, 13° 31′ 4, northwest corner of Epiphany Hall at the ground, 162° 00′ 8, southwest corner of main foundation of president's cottage, 189° 54′ 7

AFRICA

LIBERIA—*continued*

Cuttington, Maryland County, 1926—continued
Station *B* is on grounds of Cuttington College on crest of narrow ridge, east of Epiphany Hall, 5 4 meters north of center of path to Hope Cottage, 9 4 meters south of center of narrow footpath leading northeast to college gardens, and 8 5 meters west of intersection of two paths, marked by rough native stone set even with surface lettered "C I W 1926" with cross at center True bearings south gable of president's cottage, 28° 53′ 5, south edge of abutment at south end of Epiphany Hall, 51° 49′ 1 north edge of abutment at north end of Epiphany Hall, 76° 57′ 1 See Cape Palmas

Greenville (Sinu), Sinu, 1924—Close reoccupation of C I W station of 1913-14, on sandy beach, about 35 meters north of north edge of west end of street terminating at Government custom-house at its east end True bearings highest peak of rock off point, 990 meters, 26° 52′ 2, tangent to Grand Butu Point, 6 nautical miles (11 1 km), 117° 58′ 7, southern and larger of two cotton trees, about 100 meters, 219° 18′, astronomical station, 1 8 kilometers, 357° 23′ 1, Sinu lighthouse, 1 8 kilometers, 358° 00′ 5

Harper, Maryland County, 1926—Close reoccupation of C I W station of 1919, in cleared field on north side of Hoffman River, on military grounds, about 150 meters west of commanding officer's house, about 90 meters northeast of beach nearly in line between north side of commanding officer's house and stranded "Yaroba," 29 meters south of three-stemmed breadfruit tree, and 80 meters north of tall Ronnier palm standing north of road, marked by barrel-shaped block of cement extending 15 inches (38 cm) above surface of ground, lettered "C I W 1926" with cross in center True bearings light on top of Elder Dempster's bungalow, 4° 23′ 3, tip on lighthouse, 17° 07′ 4, tall Ronnier palm, 21° 31′ 5, spire on Methodist church, 329° 56′ 4

Monrovia, Montserrado—See Bushrod Island

Naama, Montserrado, 1924—South of town at the southwest corner of the District Commissioner's compound on the south side of the road, marked by cross in a metamorphic stone, 25 by 30 by 110 centimeters, set to project 5 centimeters above ground True bearings Yepaulo triangulation station, 107° 45′ 0, large tree near market, about 250 meters, 111° 48′, large tree north of town, about 300 meters, 178° 47′, stake at east edge of compound, about 90 meters, 220° 49′ 5, large tree southeast of town and at east edge of Mandingo quarter, about 200 meters, 252° 33′

Robert Port (Cape Mount), Montserrado, 1923—On low marshy ground on east side of lagoon at edge of mangrove, about 350 meters northeast of A I C factory, about 100 meters northwest of most northern group of native huts, about 20 meters northeast of canoe landing and trail to native village, and 9 5 meters from high-water line, marked by hardwood stake driven flush with ground True bearings flagstaff on R A Sherman's uptown house, 63° 09′ 0, flagstaff in front of Masonic building, 70° 20′ 4, flagstaff at custom-house, 79° 20′ 5, point of Tamielo Island, 147° 18′, north palm of two at point of Tamielo Island, 147° 56′ 4

Sanoye, Montserrado, 1924—At west edge of Government compound, 230 meters along the road leading north 15° east from native village, and 63 meters west of road at right angles, marked by cross in top of diorite stone, 25 by 30 by 60 centimeters, set flush with ground Bearings not taken to buildings in the compound, as compound is to be moved and buildings rebuilt within a few months True bearings Bong triangulation station, 13 9 kilometers, 48° 42′ 1, flagpole on native house in Sanoye, 360 meters, 346° 34′ 0, white trunk of tree on north slope of hill, 2 kilometers, 350° 00′ 0, JU triangulation station, 2 65 kilometers, 350° 37′ 7

AFRICA

LIBERIA—*concluded*

Sino, 1924 (also spelled Sinu)—See Greenville

MOROCCO

Casablanca (Dar el Baida), 1925—A practical reoccupation of C I W station of 1912, about 3 kilometers south of Casablanca, east of 3-kilometer mark on east side of road to Bourouska, near center of field belonging to an old Arab and behind some native stores, about midway between hut belonging to owner of field and white concrete house farther east, in front of which are three white pillars, it is 2 meters from southeast corner of mound apparently an old house foundation and 38 meters north of center of native road meeting road to Bourouska at right-angles between native stores and group of concrete native houses south of intersection True bearings left edge at rear of concrete houses south of road, 33° 25′ 0, most easterly of three wireless towers, 167° 20′ 1, tallest Moorish mosque, 2 kilometers, 245° 42′ 6

Larache (El Araish), 1925—Close reoccupation of Laraish *B* 1912, Laraish *A* being unavailable, about 1 kilometer southwest of town square, in an old garden spot partly surrounded by cactus hedge, just opposite the soldier barracks, about 225 meters southwest of the residence of the Duke of Vernes, not visible from station, 8 meters from hedge on north, 12 5 meters west of wooden fence, and 28 meters from hedge on south of garden True bearings spire on lighthouse, 89° 02′ 4, center one of three ornaments on Hotel Diasturias, 216° 29′.2
Station *C* is about 200 meters southwest of station *B*, on public ground, formerly property of Mr. Guagnino, 6 meters east of path, 32 5 meters southeast of telephone-pole on sunken ground, 38 meters from next pole to south (lighthouse is seen about midway between these two poles), marked by peg True bearings spire on lighthouse, 93° 57′ 4, station *B*, 211° 19′ 9, center one of three ornaments on Hotel Diasturias, 213° 44′ 5

Marrakech, 1925—Two stations were occupied about 2 kilometers west of Marrakech on road to Minara Gardens Station *A* is near east edge of an old field, about 200 meters north from intersection of north-south road with main road, and 9 5 meters west of center of north-south road, in line of row of chinaberry trees along edge of field, 3 7 meters and 6 2 meters from trees in row to north and south respectively; marked by stone 20 by 20 by 61 centimeters marked "C I W 1925," with hole at center True bearings, tip on green roof of water-house in Minara Gardens, 61° 25′ 4, spire on mosque of Koutoubia, 247° 33′ 1.
Station *B* is 66 6 meters southwest of station *A*, 8.6 meters south of an east-west irrigation ditch, 24 6 meters east of base of group of palms near north-south ditch, and 6 9 meters northeast of a bunch of bamboos True bearings tip on green roof on water-house in Minara Gardens, 61° 07′ 3, mosque of Koutoubia, 247° 40′ 5, station *A*, 249° 43′ 4, mosque 278° 07′ 9

Mogador, 1925—Close reoccupation of C I W station of 1912, about 2 5 kilometers along shore north of Moga-

AFRICA

MOROCCO—*concluded*

Mogador, 1925—continued
dor, on Moorish grounds known as Taffa, outside the Marrakech gate and between caravan route and seashore, 99 meters south of well near seashore which is in direct line to rock in sea farther north, about 86 meters from beach and about 85 meters northwest of near corner of brick warehouse, 2.8 meters from bank on west, and 6 1 meters from bank on north, marked by concrete block, 15 by 20 by 56 centimeters with cross cut in top buried flush in sand and packed in place with small stones True bearings tower of Smaa in Mogador, 44° 17′ 2, seaward edge of well near shore, 199° 56′ 3, seaward edge of Moorish house, 4 miles, 241° 01′ 0, northeast corner of small concrete hut attached to back of larger hut, 75 meters, 283° 51′ 4

Tangier, 1925—Since the exact position of stations *A* and *C* could not be identified, a new station designated *C* was established as near the old location as possible, on property formerly owned by Mr Levison, about midway between the Levison residence and Jew's River, about 75 meters below rock wall marking southeast boundary of Mr Levison's present property, about 100 meters south of concrete hut on cliff east of house of British consul and about 50 meters southwest of concrete hut farther down slope near mouth of river, on ridge of a terrace, 53 5 feet (16 31 meters) northwest of second, and 28 0 feet (8 5 meters) southwest of third cedar in first row of cedars below property wall, counting from south True bearings right top of concrete hut on sea cliff, 149° 18′ 3, left corner at top of concrete hut down slope, 208° 28′ 7, Moorish castle across harbor seen over top of small red-topped hut near cliff, 251° 33′ 8, right top of square front of concrete hut on opposite side of Jew's River at right of a group of exposed rocks, 273° 56′ 6

Rabat, 1925—Station of 1912 was closely reoccupied, about 2 5 kilometers south of center of city on property of M Leriche, near southwest corner of field bounded on south and west by cactus hedge, east of road to Rabat, adjacent to junction with road leading south to home of M Leriche, 47 feet (14 3 meters) north of cactus hedge along south boundary, 100 feet (30 5 meters) from hedge along west boundary of field, 112 feet (34 1 meters) from southwest corner of field, and 67 feet (20 4 meters) west of pear tree, marked by stone 20 by 20 by 61 centimeters, buried flush and marked "C I W 1925" True bearings tower of Mulai Sleiman, 94° 15′ 6, tower of Hassani, 184° 16′ 7, flagpole on house of M Leriche, 321° 28′ 9

NIGERIA

Amar, Muri, 1926—On north side of Benue River at river port near village of Amar, about 300 meters west of former C I W station of 1914, 7 0 meters north from top of high river bank, and 3 0 meters east of path leading to village of Amar

Ibi, Muri, 1926—Two stations were occupied Station *A* is on government grounds about three-fourths mile (1.2 km) from river port, 20 6 meters north of center of main road near government rest-house, in front of police station, and in line of south side of rest-house foundation extended 46 45 meters east of southeast corner, to be marked True bearings southeast corner of foundation of government rest-house, 61° 25′ 2, north gable of Niger Company's bungalow, 205° 33′ 6, northeast corner of doctor's bungalow, 310° 05′ 4

AFRICA

NIGERIA—*continued*

Ibi, Muri, 1926—continued
Station *B* is a close reoccupation of C I W station of 1914 On property of Sudan United Mission, between north-south raised road leading to Benue River and a hedge along west boundary of compound, at opening of hedge, 3 5 meters east of center of road, 26 2 meters north of cement beacon marking southwest corner of mission compound, and 12 4 meters south of center of driveway entering west side of compound, to be marked True bearings southwest corner of main bungalow in mission compound, 222° 31′ 1, northwest corner of iron store-building in compound, 246° 37′ 4

Jebba, 1926—Two stations were occupied Station *A* is on hill east of railway station in compound of government rest-house, 37 5 meters northwest of northwest corner of rest-house, 11 meters southwest of center of old walk, nearly in line with two nut trees, 1 9 meters northwest of the nearer and 4 5 meters northwest of farther tree True bearings right gable of two on southeast end of railway engineer's bungalow, 133° 32′ 1, flagpole on east edge of hill, 167° 09′ 9, southwest corner of rest-house, 304° 32′ 4

Station *B* is a practical reoccupation of C I W station of 1914 On hill nearest south end of railroad bridge, west of point where north road reaches summit and east of Niger Company's bungalow, 4 0 meters west of main gravel walk parallel with hilltop, 6 meters north of walk entering Niger Company's compound, 11 5 meters south of walk to tennis-court, and 2.2 meters north of small tree at west side of main gravel walk, marked by circular pile of stones True bearings east gable of Niger Company's bungalow, 51° 59′ 3, railway rail at southeast corner of tennis-court, 125° 51′ 4, southwest corner of railway station, 278° 59′ 7

Kano, 1926—Two stations were occupied Station *A* is a reoccupation of C I W station of 1914, about 1 5 kilometers northeast of railway station, north of Bompai road, about 400 meters northwest of Kano Club house, 75 paces north of boulder 10 meters high standing north of Bompai road, within cluster of boulders, 3 meters west of large boulder, 2 2 meters north of small boulder, 6 5 meters southeast of northeast end of boulder 11 meters long, 5 meters wide, and 1 5 meters high, marked by Nigerian Survey beacon with point of arrow in top marking exact point True bearings fork of small acacia tree, 66° 41′ 0, west chimney of two on French Company's bungalow, 68° 57′ 2, steel telegraph-pole on north side of Bompai road, 326° 42′ 2

Station *B* is about 300 meters south of Kano Club house, east of Bompai road, 12 0 meters east of east boundary of polo grounds, in line with east edge of raised side of foundation for stands extending north 15 6 meters from its northeast corner, and 20 45 meters northeast of its northwest corner, marked by Nigerian Survey beacon numbered 169 with small hole in top True bearings steel telegraph-pole, 53° 58′ 0, flagpole on railway station in Kano, 60° 37′ 4, east post supporting net on tennis-court of Kano Club, 190° 39′ 7

Lagos, 1926—Three stations were occupied Stations *A* and *B* being exact reoccupations of C I W station of 1914, and station *C* is close reoccupation of C I W station of 1915 Station *A* is 20 chains (402 meters) north of Lagos Observatory, about 3 miles (4 8 km) from port of Lagos, in subdivision called Ikoye, about one-half mile (0 8 km) east of tennis-club, about one-

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NIGERIA—*continued*

Lagos, 1926—continued

third mile (0.5 km.) southeast of home of Dr. Martin, over a pier about 1 meter high, marked "220P IKP." True bearing: plumb-line over line-marker (station B), 180° 00′.2. It was found that cross marking station is in top of an iron bar 1 inch (2.5 cm.) in diameter and not less than 12 inches (30 cm.) long.

Station B is over pier marked "265P IKP," which is north end of meridian line of Southern Nigerian Survey, south end being pier described as station A, 6 chains (120.7 meters) distant. True bearing: pier 220P. IKP (station A), 0° 00′.2.

Station C is about 2.5 miles (4 km.) northeast of Lagos, 31.5 meters north of metaled road to Ikoye opposite new barracks for black soldiers, and about 200 meters east of cemeteries, about 250 meters south of lagoon, on line through two cement pillars 60 meters apart marked "200P IKP" and "651 PB," 27.5 meters east of latter or more easterly one. True bearing: west wireless mast in Lagos, 72° 50′.8.

Lokoja, Kabba, 1926—Two stations were occupied which are proximate reoccupations of C. I. W. station of 1914. Station A is at north corner of golf course across avenue south from marine officers' bungalow, 31.2 meters northwest of northwest corner of veranda pillar of station magistrate's office, 10.2 meters west of nearest of three mango trees at boundary of golf course, 15.2 meters southwest of mango tree near avenue, within fork formed by two paths, 10.4 meters from path to north and 4.1 meters from path to east, marked by cement brick 15 by 15 by 30 centimeters set flush with surface, with cross in top. True bearings: northwest corner of bungalow number 14, 50° 34′.1; flagpole in marine bungalow compound, 198° 07′.1; northwest corner of police office building, 295° 39′.4; northwest corner of magistrate's office, 335° 00′.2.

Station B is at west end of golf-course, southwest of golf-house, beyond small stream which cuts across west corner of golf-course, 18 meters southwest of gravel path along west side of stream, 18.8 meters east of southeast end of bunker, and 2.5 meters west of large tree, marked by cement brick 20 by 20 by 50 centimeters set flush with surface with cross at center. True bearings: flagpole at marine bungalow, 254° 20′.6; flagpole at residence, 337° 09′.3.

Yola, 1926—Two stations were occupied. Station A is south of polo-grounds, in northeast corner of medical officer's compound, 15.0 meters south of center of road along south side of polo-grounds, 12.5 meters west of center of narrow walk along east side of compound, and 10.1 meters southeast of center of driveway leading to medical officer's residence, marked by rough stone extending 6 centimeters above surface of ground with cross marking center. True bearings: southeast corner of medical officer's residence, 49° 12′.0; east gable on small tin-roofed house on north side of polo-grounds, 162° 50′.9; flagpole at residence north of polo-grounds, 200° 06′.5.

Station B is in Yola-European reservation on recreation field and is 19.75 meters east of northeast corner of concrete tennis-court in line with north edge. True bearings: southeast corner of medical officer's residence, 45° 05′.8; flagpole at residence, 169° 55′.5; center of sun-dial in front of provincial officer's bureau, 330° 02′.4.

Zaria, 1926—Two stations were occupied. Station A is a practical reoccupation of C. I. W. station of 1914, at southeast corner of golf-links, about 300 meters west of railway property fence, nearly west of point midway between railway rest-house and bungalow of foreman of works, and at south edge of fairway to golf-green nearest railway property, marked by concrete brick 20 by 20 by 35 centimeters, extending 15 centimeters above surface. True bearings: right edge of monument to Nigerian soldiers killed in World War, 91° 07′.9; survey triangle marker on high hill, 138° 09′.2; west gable of railway station, 252° 43′.6.

Station B is about 350 meters west of A at south end of golf-links, about 175 meters southwest of only mud bungalow on links, about 150 meters north of main road, within a circular arrangement of trees, 10.5 meters southeast of only mango tree in the circle, 15 meters northeast of path through circle, and 40 meters southwest of fourth tree from native path. True bearings: steel telegraph-pole, 35° 48′.4; northwest corner of court-house, 331° 41′.6.

SIERRA LEONE

Bo, 1925—Close reoccupation of C. I. W. station of 1912, about three-fourths mile (1.2 km.) north of railway station, in compound of United Methodist Mission, about 300 feet (91 meters) west of chief mission-house, about 200 feet (61 meters) west of small tennis-court, 70 feet (21.3 meters) southwest of lone oil-palm tree, 75 feet (22.9 meters) west of native tree, 130 feet (39.6 meters) northwest of nearest guava tree, and 60 feet (18.3 meters) east of line of high bush which is present west boundary of mission grounds, marked by cross in top of stone projecting 1 inch (2.5 cm.) above ground. A similar stone was placed 130 feet (39.6 meters) southeast, under and 5 feet (1.5 meters) east of trunk of the nearest guava tree in the orchard. True bearings: lone palm, 1 mile (1.6 km.), 78° 46′.0; oil palm, 250 yards (229 meters), 187° 05′.8; oil palm, 70 feet (21.3 meters), 210° 42′ (approx.); second stone marker, 130 feet (39.6 meters), 317° 27′.2.

Freetown, 1925—Close reoccupation of C. I. W. station of 1912, on parade grounds on King Tom Peninsula, about 1½ miles (2.4 km.) by road west of Freetown. It is 148 feet (45.1 meters) north of Freetown road through parade ground, opposite the football-field, 112.2 feet (34.20 meters) northeast of northeast corner of concrete cricket alley, 183 feet (55.8 meters) southwest of large cotton tree, marked by native brick, 8 by 10 by 20 inches (20 by 25 by 51 cm.) lettered "C. I. W. 1925," and set 2 inches (5 cm.) below surface. Two crosses cut in the north end of the concrete cricket alley are in line joining station with northeast corner of stone guard-house. True bearings: southeast corner of concrete cannon-house, 48° 03′.8; northeast corner of guard-house, 61° 00′.5; tip on north wireless tower, 266° 19′.9; north flagpole of two on African East Trading Company, 269° 13′.8.

Moyamba, 1925—Practical reoccupation of C. I. W. station of 1912, about one-half mile (0.8 km.) east of railway station, about 150 yards (137 meters) west of new building of United Brethren mission, about 100 yards (91 meters) north of huts used as barracks by court messengers, 100 feet (30.5 meters) from middle of road on southwest, 42 feet (12.8 meters) west of papaw tree at corner of Creole cemetery, and 18 feet (5.5 meters) west of road along front of this cemetery; marked by cross and letters "C. I. W. 1925" in top of concrete block set in concrete. A second concrete block with cross cut in top was placed about 200 feet (61 meters) southwest of magnetic station in

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SIERRA LEONE—*concluded*

Moyamba, 1925—continued
corner of mission compound just outside of mission fence True bearings small tree used as north gate-post of Creole cemetery, 185° 40′.4, tip of most easterly of messenger barracks, 330° 12′.8, second concrete block, 332° 12′

TANGANYIKA TERRITORY

(Note Earlier occupations of repeat stations in this section will be found listed under German East Africa in Volume I of this series)

Dar-es-Salaam, 1921—On coast east of Governor's palace, between main road along water-front and beach, 135.8 feet (41.39 meters) north of northeast corner of former German magnetic observatory, in which the C I W observations of 1909 were made, and 38.1 feet (11.61 meters) east of center of main road, marked by stone block, 6 by 6 by 18 inches (15 by 15 by 46 cm), firmly embedded in a mass of coral rock and cement, its top face left slightly above surface of sand, and lettered "C I W 1921" True bearings northeast corner of observatory, 9° 26′.9, red tower at south end of meteorological observatory, one-fifth mile (0.3 km), 118° 16′.0, distant point of land, 5 miles (8 km), 171° 34′.5, top of lighthouse tower, 2 miles (3 km), 239° 21′.4, eastmost point of land, 10 miles (16 km), 269° 33′.8, navigation mark on rock, 2 miles (3 km), 274° 04′.7, signal-staff on pilot's house, one-half mile (0.8 km), 333° 51′.6

Dodoma, 1921—On public common between railway line and market place, on west side of main road leading from boma (government post) to market place, 36.5 feet (11.13 meters) west of hedge on west side of main road, measured from point 210 paces north of railway-line crossing, and 22 feet (6.7 meters) east of foot-path, marked by a rough block of granite, its top face projecting slightly above surface of ground True bearings bottom of north arm of railway signal, 250 yards (229 meters), 57° 26′.3, east end of roof of market building, 180 paces, 190° 10′.2, west gable end of railway station, one-half mile (0.8 km), 311° 33′.0, top of chimney appearing above roof of boma, one-fourth mile (0.4 km), 352° 45′.2

Kigoma, 1921—On open grassy slope southeast of railway terminus and northeast of Afrika Hotel, 264.1 feet (80.50 meters) west of southwest corner of fence around residence of Belgian contractor, and 71 feet (21.6 meters) south of southmost of two mango trees in line, marked by a cement block 6 by 6 by 24 inches (15 by 15 by 61 cm), its top face buried 3 inches (8 cm) below surface and covered with a cairn of rock True bearings top of red-roofed house on hill, three-fourths mile (1.2 km), 59° 09′.0, wireless mast, 2 miles (3.2 km), 105° 52′.5, flagstaff outside terminus, 600 feet (183 meters), 111° 37′.2, top of chimney on railway station, 120° 15′.3, southmost of two mango trees, 194° 49′, top of front gable of contractor's residence, 239° 54′.6

Kilimatinde, 1921—In small level clearing on hillside, about 600 feet (183 meters) northeast of residence of district political officer in northeast corner of market place, just east of kopje of granite boulders, and 41 paces north of prominent bushy tree True bearings prominent bushy tree, 24° 46′, south veranda-post of prison, 800 feet (244 meters), 39° 57′.8, south corner of political officer's residence, 62° 19′.4, top of prominent baobab on hillside, 1 mile (1.6 km), 359° 03′.7.

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TANGANYIKA TERRITORY—*continued*

Kilosa, 1921—About 47 paces north of C I W station of 1909, on west side of main road leading north from railway station, just beyond north end of native village and just south of point where small road turns off northwest into bush to residence of Captain Turnley, about 670 paces north of railway station, and 9 paces west of main road, marked by peg to be replaced by stone by local authorities True bearings south edge of tower of house on hillside, 1 mile (1.6 km), 37° 10′.0, north gable end of residence on hill, 1,000 yards (914 meters), 64° 17′.9, large baobab tree, 150 feet (46 meters), 179° 41′, mimosa tree, 62.5 feet (19.05 meters), 268° 46′.2

Malongwe, 1921—On grassy flat about 600 feet (183 meters) north of railway station, and in line with its western side, about 150 feet (46 meters) east-northeast of native water-hole, 13 paces west of native path from village to railway station, and 4 paces south of path leading from water-hole to small village to east True bearings east end of roof of rest-house, 21° 11′.7, top of stone at west end of roof of railway station, 33° 06′.1, large baobab tree, 800 feet (244 meters), 200° 29′, large baobab tree, 800 feet (244 meters), 288° 20′

Mazengo, 1921—On plain about 1.5 miles (2.4 km) south of Government post of Kilimatinde, on grassy flat just north of village of Mazengo, at a point 800 feet (244 meters) northwest of and in line with large baobab tree on western outskirts of village and northwest corner of northmost hut, 305 paces north of chief's hut, 40 paces from native path on east, and 16 paces from main path to Kilimatinde on west True bearings baobab tree on western outskirts of village, 54° 07′, prominent baobab tree on summit of hill, 1.5 miles (2.4 km), 156° 25′

Ngere Ngere, 1921—About 100 feet (30 meters) south of C I W station of 1909, southeast of railway station, about 100 paces southeast of road running parallel to railway, south of native huts and east of path to railway station at a point where path begins descent to bed of small stream True bearings top of south edge of store at intersection of paths, 123° 08′.9, bottom of east corner of veranda platform of store, 220 feet (67 meters), 132° 30′.1, top of east side of railway water-tank, one-fourth mile (0.4 km), 161° 30′.3

Saranda, 1921—On alluvial flat, 10 paces northwest at right angles from main road leading north from railway station at a point 445 paces along road from railway, where road is joined by a cart track from large iron store-shed northeast of railway station True bearings east end of roof of large store-shed, 600 feet (183 meters), 15° 59′.5, west end of roof of railway station, 36° 51′.8, signal on railway, one-half mile (0.8 km), 72° 58′.8, east end of roof of residence, 1.5 miles (2.4 km), 130° 41′.7, prominent tree on distant kopje, 10 miles (16 km), 311° 54′.1

Tabora, 1921—Two stations, *A* and *B*, were occupied Station *A* is about one-fourth mile (0.4 kilometer) north of C I W station of 1909, and three-fourths mile (1.2 km) north of boma, in a grove of mango trees in angle formed by Boma and Herrmann streets, about 500 feet (152 meters) north of Kaiserhof Hotel, 70 paces north of north side of Herrmann Street measured from a point 130 paces east of its junction with Boma Street, and 67.4 feet (20.54 meters) from northeast mango tree of grove True bearings ornament on top of Kaiserhof Hotel, 1° 07′.7, most easterly of two chimney-stacks of railway

AFRICA

TANGANYIKA TERRITORY—*concluded*

Tabora, 1921—continued
works, one-half mile (0 8 km), 197° 01′ 9, northeast mango tree of grove, 211° 26′, bottom of west support of water-tank, one-fourth mile (0 4 km), 251° 24′ 7, south end of roof of railway station, one-fourth mile (0 4 km), 264° 08′ 4

Station *B* is on open grassy place south of boma, 277 feet (84 4 meters) south of southeast corner and in line with east wall of boma and 5 paces north of foot-path, marked by a concrete block, projecting one foot (30 cm) above ground, and lettered "C I W, 1921," a drill-hole indicating exact point True bearings bottom of southwest corner of boma wall, 400 feet (122 meters), 142° 03′ 9, top of chimney of building inside boma, 300 feet (91 meters), 154° 40′ 9, bottom of southeast corner of boma wall, 190° 23′ 5, top of north edge of tower of large residence, one-fourth mile (0 4 kilometer), 298° 07′ 4, north end of roof of residence, 300 yards (274 meters), 329° 37′ 3

Ujiji, 1921—On open land between main street and west wall of Government post and exactly in line with northwest wall of post, 83 85 feet (25 557 meters) northwest of flagstaff, 117 7 feet (35 88 meters) from northwest corner of Government post, and 112 45 feet (34.275 meters) west of center of astronomical pillar outside gate True bearings prominent palm-tree in native town, one-half mile (0 8 km), 67° 40′, cleft in rock on hills, 4 miles (6 km), 98° 00′ 4, southwest corner of building, 300 feet (91 meters), 156° 42′ 6, northwest corner of Government post, 248° 36′ 9, astronomical pillar, 284° 08′ 0, flagstaff, 335° 59′.2

Zanzibar, Zanzibar, 1921—See under Islands, Indian Ocean

TUNISIA

Sfax, 1922—Exact reoccupation of C I W station of 1911, west of Sfax, on eastern edge of cart-track along mud wall surmounted by cactus hedge, joining main road to Gabes about 400 meters south of La Louise oil and soap factory, near north corner of uncultivated field, 8 1 meters southwest of top of mud wall running northwest and southeast, 7 9 meters southeast of ruined mud wall running northeast and southwest and dividing cultivated and uncultivated fields, and 12 8 meters south of top of south corner of mud wall surmounted by cactus hedge, marked by stone post about 5 centimeters square, flush with surface of ground True bearings north finial on red-roofed house, about 600 meters, 125° 32′ 1, lightning-rod on chimney of soap factory, about 600 meters, 200° 13′ 6, minaret of Palais de Justice in Sfax, about 3 kilometers, 240° 25′ 5

Tunis, 1922—Close reoccupation of C I W station of 1911, southwest of Tunis, near shore of small lake on road to Sedjoumi, about 200 meters north-northeast of Sedjoumi School, 7 5 kilometers from western gate (Bab-el-Allonch) of Tunis, in line with and between lone palm-tree and boundary-stone marked "80," 19 5 meters north of lone palm-tree, and 18 meters southeast of center of ditch on southeast side of cart-track running from main road towards lake, marked by tent-peg left 5 centimeters above surface of ground True bearings base of telegraph-pole on school, 18° 40′ 9, tall chimney on hills, about 8 kilometers, 206° 02′ 3, spire on mosque on hill, about 8 kilometers, 235° 17′.2

ASIA

ARABIA

Aden, 1921—Two stations were occupied Station *A* is about 350 feet (106 7 meters) east of C I W station of 1914 and 1918, no longer available, about 200 feet (61 0 meters) east of Queen Victoria Monument, on eastern part open space called "Crescent," in line with west side of square house adjoining Hotel Continental on west, 198 feet (60 4 meters) south of south corner of Bank of India, 145 79 feet (44 44 meters) southeast of center of base of lamp-standard, 178 88 feet (54.52 meters) north of west wall of square house west of Hotel Continental, marked by a stone 12 by 12 by 20 inches (30 by 30 by 51 cm) its upper surface slightly above ground and lettered "C I W 1921" True bearings crown on Queen Victoria Monument, 88° 40′ 6, top of clock-tower, 102° 37′ 0, nearby lamp-standard, 147° 13′ 4, south corner of National Bank of India building, 197° 12′ 2, Sham-sham signal-staff, 318° 17′ 8

Station *B* is the British Admiralty magnetic station of 1909 on Arabian mainland, across Aden Harbor, about 2 5 miles (4 0 km) north of Prince of Wales Pier, 110 paces north of scattered scrub just above high-water mark on shore, exactly in line with the two wireless-station masts to east, and almost in line with war memorial and a small white mosque immediately south of it at Prince of Wales Pier, marked by a concrete block 6 by 6 by 24 inches (15 by 15 by 61 cm), left projecting 6 inches (15 cm) above surface of ground True bearings minaret at Sheikh Othman, 5 miles (8 km), 210° 40′ 0, wireless masts, 1 mile (1 6 km), 274° 28′ 6, Sham-sham signal-mast, 3 miles (4.8 km), 323° 55′ 0, clock-tower, 2 5 miles (4 0 km), 344° 51′ 0, signal-station, 3 miles (4 8 km), 351° 39′ 8

El Wedj, Hejaz, 1922—About one-half mile (0 8 km) northeast of landing jetty, near head of natural harbor, about 300 feet (91 meters) south of caravan route from El Wedj to interior and about 120 feet (37 meters) north of high-water mark True bearings left edge of base of beacon tower, about three-fourths mile (1 km), 10° 33′ 5, spire on near mosque in El Wedj, about one-fourth mile (0 4 km), 56° 42′ 7, lowest visible point of wireless mast, about one-third mile (0 5 km), 105° 17′ 0, conspicuous gravestone under cliff, about three-fourths mile (1 km), 231° 01′.2

Jidda, Hejaz, 1922—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1918 and a close reoccupation of that of 1911, near observation spot of British Admiralty, about 1 5 miles (2 4 km) southeast of Jidda, near center and highest point of a low sandy reef named Jezirat el Mifsaka True bearing minaret in western part of Jidda 212° 36′ 8

Station *B* is about one-half mile (0 8 km) northwest of Jidda, between northwestern shore of shallow inlet and golf-links, in line with mast on Karakon (Hejaz Admiralty building) and tall minaret of Manara Mosque, and about 300 feet (91 meters) from normal high-water mark, marked by sandstone and cement post 23 by 23 centimeters with cross in top True bearings base of wireless mast at Eve's Tomb, one-half mile (0 8 km), 288° 36′ 7, base of flagpole at barracks, 308° 04′ 0, mosque at Maraba Sherif, 320° 57′ 4, top of Manara Mosque, 345° 49′ 1, left edge of chimney at condenser, 359° 00′ 7

Yambo, Hejaz, 1922—On open ground, about one-fourth mile (0 4 km) along shore southwest of landing jetty, and about 100 feet (30 meters) from high-water mark True bearings base of wireless mast, 174°

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ARABIA—*concluded*

Yambo, Hejaz, 1922—continued
02′.7, navigation beacon, about three-fourths mile (1 km), 256° 51′.2, left edge of house on small island, about 4 miles (6 km), 342° 24′.7

CHINA

Canton, A_8 and B_8, Kwangtung, 1921, 1922—The non-magnetic huts erected in 1914 as base stations for the survey of China were reoccupied, near southeast corner of campus of Canton Christian College, on parkway about 165 feet (50 meters) south of Residence 20 or Jackson Lodge, hut *A* being 89 feet (27.1 meters) south of *B*. True bearings from pier A_8: cross on wall at east end of Residence 20, 190° 00′.4, top of Whampoa Pagoda, 267° 28′.2, true bearings from B_8: cross on pillar near west end of Residence 20, 192° 42′.6, top of Whampoa Pagoda, 267° 31′.5

Chengchow, Honan, 1922—Two stations were occupied. Station *A* is about 6 feet (1.8 meters) north of C. I. W. station of 1907, 1909, which can not be occupied because of construction of a wall over the spot, nearly south of a residence at Southern Baptist Mission, in southeast corner of tract formerly used as a burial-ground, 6 feet (1.8 meters) north of mud wall bounding tract on south, in line with south wall of compound to eastward, and 16 paces west of southwest corner. True bearing: west gable of residence at Mission (Mr. Herring's), 166° 29′.3

Station *B* is about 450 yards (412 meters) northeast of C. I. W. station of 1907, 1909, in foreign cemetery, a small high-walled inclosure southeast of Mr. Lawton's residence in compound of American Baptist Mission, near east edge of small circular plot near center of cemetery, 48 feet (14.6 meters) south of east pillar of gate, 94.3 feet (28.74 meters) southeast of northwest corner of cemetery wall, marked by hollow gray stone 7 by 7 by 24 inches (18 by 18 by 61 cm.) with Chinese ornamentation on sides. True bearings: taller of two factory chimneys, one-half mile (0.8 km.), 13° 52′.0, telegraph-pole visible through wall, one-third mile (0.5 km.), 14° 16′.9, northwest corner of cemetery wall, 141° 08′.3, inner side of east brick pillar of gate, 194° 52′.2, near end of a Chinese roof, 200 feet (61 meters), 238° 37′.3

Peking, 1907, Chihli, 1922—About 3 feet (0.9 meter) west of C. I. W. station of 1907, 1909, 1915, in northeast corner of Tartar city, near Lama temple, within observatory grounds of Russian Ecclesiastical Mission (Chinese name "Pei Kuan"), 36.1 feet (11.00 meters) west of southwest corner of brick observing-tower which carries sunshine bulb. Observatoire Central de Pekin cooperated in placing marker, which is a granite stone 7.5 by 7.5 by 27 inches (19 by 19 by 69 cm.), its top face left projecting 3 inches (8 cm.) above surface of ground, lettered "C. I. W. O. C. P. 1922," and also with name of Peking Observatory in Chinese characters. True bearings: bottom of chimney-stack at flour-mill, 600 feet (183 meters), 204° 52′.8, bottom of northwest corner of sunshine tower, 267° 13′

Peking, 1916, Chihli, 1922—Close reoccupation of C. I. W. station of 1916, in former public park, now cultivated land, about one-fourth mile (0.4 km.) northwest of north gate of entrance to Temple of Agriculture inclosure, which is opposite Temple of Heaven and separated from it by main road leading from south gate of Peking to Chien Yang Men (front gate of Tartar city), 37 feet (11.3 meters) from tree to southwest, and 30 feet (9.1 meters) from tree-stump to northeast. True bearings: top of water-tower, 74°

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CHINA—*concluded*

Peking, 1916, Chihli, 1922—continued
57′.8, tower in Legation quarter, 220° 41′.3, west ornament on Temple of Agriculture, 341° 04′.9

Hankow, Hupeh, 1922—Exact reoccupation of C. I. W. station of 1916, in central field of race-course, back of eastern end of German concession, near northwestern side of course, west of golf-course, 25 paces northeast of inner corner of steeple-chase hurdle near half-mile post, and 32 paces east of a point on inner rail of trial track measured toward half-mile post, marked by stone embedded below ground in block of concrete, portion above ground measuring 8 by 8 by 8 inches (20 by 20 by 20 cm.), and lettered "C. I. W. 1916, M. Sta." True bearings: half-mile post of course, 98° 31′.7, tip of cupola on club-house, 339° 59′.8, weathercock on tower of stables, 358° 30′.0

Kalgan, Chihli, 1922—Exact reoccupation of C. I. W. station of 1915, in compound of former mission of Russian Greek Church, now in ruins, which is located about 1 mile (1.6 km.) beyond north gate of city, on south side of main road of pass into Mongolia, about one-fourth mile (0.4 km.) west of Russian post-office, in open space in west half of compound, in line with east edge of square stone platform of former kiosk, and 33.2 feet (10.12 meters) north of its northeast corner, marked by a rough block of stone, its apex buried about 3 inches (8 cm.) beneath surface of ground. True bearings: northeast corner of platform of kiosk, 20° 0′, vertical axis of Chinese character on wall, one-fourth mile (0.4 km.), 271° 38′.3, chimney of house on hillside, one-fourth mile (0.4 km.), 273° 05′.9, bottom of northeast corner of ruined church, 299° 52′.5

Nanking, Kiangsu, 1922—About 400 feet (122 meters) northwest of C. I. W. station of 1907, near middle of recreation ground of Nanking University, in alignment with buttresses on north end of Y. M. C. A. building, and those of the east side of chapel, 191.7 feet (58.43 meters), and 187.7 feet (57.21 meters) from the nearest buttress of the two buildings respectively, and 55.3 feet (16.86 meters) south of inner edge of running track measured along line of east side of chapel extended, marked by stone 7 by 7 by 27 inches (18 by 18 by 69 cm.) set with top 6 inches (15 cm.) beneath surface, a cross indicating exact center. True bearings: northeast buttress of chapel at bottom, 00° 49′.4, flagstaff on Cooper Hall, 30° 14′.8, northeast corner of northmost pillar of large dormitory, 53° 30′.1, bottom of northeast buttress of Y. M. C. A. building, 91° 23′.9, ornament on tower, one-half mile (0.8 km.) 171° 17′.5, end of roof of house, 348° 07′.5

FRENCH INDO-CHINA

Phantiet, Cochin China, 1923—Close reoccupation of C. I. W. station of 1912. In public park opposite Ecole de Plun-Ex-Circle (old hotel), about 75 feet (22.9 meters) east of 1912 station, on east side of main road from railroad station to river bridge, on slight knoll near center of triangle formed by main road to railroad and intersecting park paths, 42.5 feet (12.95 meters) northeast of corner of concrete base of telegraph-pole, 48 feet (14.6 meters) east of hedge fence along main road, and 130.2 feet (39.68 meters) northwest of north corner of cement curb of well, marked by stake projecting 6 inches (15 cm.) above ground, used for tying horses. True bearings: ornament on west end of building seen across river, one-fourth mile (0.4 km.), 65° 43′.7 right edge of schoolhouse, 135° 40′.9, west corner of concrete well-curb, 326° 40′.6

ASIA

FRENCH INDO-CHINA—*concluded*

Saigon, Cochin China, 1924—Proximate reoccupation of C I W station of 1912 In midst of open country used as native burial ground, lying northwest of main city along Rue du General Lize and just over Saigon-Cholon city limits, 116 5 feet (35 51 meters) south of Rue du General Lize, measured from point midway between sixth and seventh trees counted west from Rue de Thu Thann, at a point in line with south edge of lone prominent rectangular concrete tomb and 100 feet (30 5 meters) west of southwest corner and 101 0 feet (30 78 meters) west of northwest corner, marked by round oak peg driven just below surface of ground True bearings left edge of smoke-stack toward Cholon, 5 miles (8 km), 1° 21′ 8, left edge of left wireless mast, one-fourth mile (0 4 km), 105° 48′ 0, near corner of left target base at fort, 1 mile (1 6 km), 197° 20′ 2, right edge of concrete tomb, 234° 55′ 8, tip of spire on prominent church, 2 miles (3 2 km), 263° 04′ 2

JAPAN

Kakioka Observatory, Tokyo, 1922—Intercomparison observations were made at station *A*, the absolute house in which there are two piers, one for magnetometer and one for inclination observations, and at two tent stations, station *B*, which is 50 5 feet (15 39 meters) southeast of southeast corner of absolute house, and station *C*, which is 31 7 feet (9 66 meters) south-southwest of southwest corner of absolute house

SIBERIA

An-ma-la, 1921—See No 48

Ayon Island, 1919-20—See Nos 21 and 40

Cape Bering, 1921—See No 48

Cape Serdze Kamen, 1920-21—See No 41

Emma Harbor, 1921—See No 46

Fram Island, 1919—See No 17

Holy Cross Bay, 1921—See No 49 (Mass-kan) and No 50

Jan-da-ken-nut, 1921—See No 44

Kain-ge-skon, 1921, 1922—See Nos 22, 42, and 54

Lockwood Islands, 1918, 1919—See Nos 4 and 16

Machu-a-am River, 1919, 1920—See No 35

Mass-kan, 1921—See No 49

Nabba-kotta, 1921—See No 45

Panteleika, 1920—See No 36

Pitlekai, 1921—See No 53

Pokincha River, 1919, 1920—See Nos 34 and 38

Port Dickson, 1918—See No 3

Rauchu-an River, 1920—See No 39

South Head, 1921—See No 43

Station No 3 (Port Dickson), 1918—Southwest of radio station True bearings radio mast, 241° 33′, conspicuous stone on summit of hill seen beyond small island, 267° 01′ Mound of stones was built upon site of station

Station No 4, Winter-Quarters, 1918-1919—Off north coast of Chelyuskin Peninsula are two small islands, called Lockwood Islands by Fridtjof Nansen, in latitude 77° 35′N and longitude about 105° 40′ east of Greenwich Large cairn was built on northeastern island and contains full information regarding winter-quarters of the *Maud* during 1918-19, and place where magnetic observations were made Winter-quarters were 7 kilometers south 40° east from cairn on shore of bay opening to northwest Magnetic observatory (designated station No 4) was erected 14 meters from water, on eastern shore, which runs south-southwest to north-northeast for about 1 5 kilometers and almost at middle of this stretch Wooden post on which magnetometer was permanently mounted during winter of 1918-19 was left in place, this post was driven as far down as frozen ground permitted, and at conclusion of work was surrounded with stones and covered with copper plate inscribed "Magn obsv Maud expedition 1918-1920" Two arrows engraved on plate show south and direction of mark Mark was driftwood log, built in cairn on top of small cape about 600 meters distant Astronomical station is about 40 meters south of magnetic observatory and is also marked with wooden post driven into ground, surrounded by stones and covered by copper plate

Station No 4*b* was 16 meters north 47° east of station No 4

Station No 4*c* was 26 meters south 3° west of station No 4

Stations Nos 5 to 15, 1919—As it was impossible to erect any permanent marks to indicate stations, no descriptions suitable for relocation purposes can be given Approximate latitudes and longitudes are all derived from sextant observations, checked by dead reckoning which was kept up on sledge-trips, longitudes depend upon adopted value of 105° 40′ east of Greenwich for station No 4 Station No 13 was located on sea-ice, about 5 kilometers from coast, the others are on land

Station No 16 (Lockwood Islands), 1919—On northeastern of the Lockwood Islands, close to cairn of Expedition, 7 kilometers north 40° west from station No 4

Station No 17 (Fram Island), 1919—On middle of Fram Island, 2 8 kilometers north 30° east from station No 4

Station No 18, 1919—Under hills, 4 9 kilometers south 28° west from station No 4

Station No 19, 1919—On sea-ice, 3 5 kilometers north 70° west from station No 4

Station No 20, 1919—On low ridge of clay, 2 2 kilometers south 66° east from station No 4

Station No. 21 (Ayon Island), Winter-Quarters, 1919-1920—On ice close to where the *Maud* was frozen in off coast of Ayon Island in latitude 69° 52′ 5 and longitude 167° 43′ east of Greenwich, and about 13 kilometers north of shallow strait separating Ayon Island from mainland there is small river in deep valley (On older maps island is indicated as being divided into two parts where this valley lies, which is a mistake and which has been corrected on newer maps) Approximate location of the *Maud* was 2 5 kilometers directly off coast at point about 4 kilometers to south of this valley at first and only creek extending some distance inland

Stations Nos 22 to 33, 1920—Positions of stations Nos 22 to 33 were derived from chart of Siberian Coast, published by Russian Marine Department (Hydro-

ASIA

SIBERIA—*continued*

Stations Nos 22 to 33, **1920—continued** graphic Division) in 1914 On sledge-trip on which these stations were occupied, distance wheel was used with sledge and positions which, on account of character of coast, were difficult to derive from charts, were obtained by applying measured distance from nearest conspicuous point This chart seems to be very reliable, values and scaled longitudes are in perfect agreement with those the Expedition determined by means of chronometers Positions given should therefore be correct within 1 or 2 miles No descriptions can be furnished except for station No. 22, which is the same as that occupied in 1921 and described as station No 42

Station No 34, 1919—About 3 kilometers south of entrance to narrow valley leading directly toward conspicuous cone-shaped mountain, this valley is tributary of Pokincha River which flows from east to west in latitude 68° 39′N and is about 6 kilometers east from edge of forest and south of point where deep valley from northeast meets Pokincha

Station No. 35, 1919, 1920—Situated across mountains, south of station No 34, on first timbered ridge west of northwestern top of low range of hills, rising above forest limit, and limiting open basin of Machu-a-am River

Station No 36 (Panteleika), 1920—At Siberian village Panteleika, about 25 kilometers east of Nijne Kolymsk, on slope about 200 meters east-northeast from southeastern house in village True bearing spire of partially-built church 88° 48′ 6 Ground was frozen, so no mark could be erected, but Russian trader in Panteleika promised to drive down pole to mark station in summer

Station No 37, 1920—In large forest, no description possible

Station No 38, 1920—About 4 kilometers southwest of station No 34, on ridge separating valley in which station No 34 was located from smaller valley to west

Station No 39, 1920—About 500 meters south of small river which parallels Rauchu-an River about 12 kilometers to southwest and is between it and mountain Keedleely-gool Valley is broad, but small river follows north side and flows close to steep hill before turning northeast at junction with another river, station is about 4 kilometers from turn

Station No 40 (Ayon Island), 1920—In middle of perfectly smooth plain about 200 meters south of small creek referred to in description of station No 21

Station No 41 (Cape Serdze Kamen), Winter-Quarters, 1920-21—Stations *b, c,* and *d* were all close together at northern end of sand-spit separating small lagoon and small open bay south of Cape Serdze Kamen, about 30 meters from small creek which runs to sea and forms northern boundary of sand-spit, and about 30 meters from sea Some native tents are usually located on northern part of sand-spit Station No 41 is about 400 meters northeast of others and on accumulated snow slope covering steep coast

Station No 42 (Kain-ge-skon), 1921—On flat ground above beach 100 meters west of large whale-vertebra, which natives worship, and southwest of most western of stores and houses built by trading companies southwest of native village

ASIA

SIBERIA—*concluded*

Station No 43 (Yan-dang-ai), 1921—In small open creek about 70 meters southwest of trading company store on small plain, about 10 meters above sea-level, and about 200 meters northwest of native village Yan-dang-ai, which is called South Head by traders

Station No 44 (Jan-da-ken-nut), 1921—On southwest side of steep cape, 3 kilometers east of native village Jan-da-ken-nut at place where coast turns abruptly to northeast, about 40 meters from shore-line and 100 meters from small brook

Station No 45 (Nabba-kotta), 1921—Seventy meters west-northwest of European house built by native at Eskimo village called Nabba-kotta, on smallest of islands north of Indian Point

Station No 46 (Emma Harbor), 1921—Fifty meters south of southwest corner of two large storehouses east of Russian Government building

Station No 47, 1921—No description

Station No 48 (An-ma-la), 1921—In western part of native village An-ma-la at Cape Bering, 115 meters southwest from east corner of western of two stores and 120 meters southwest from east corner of eastern store True bearing top of pinnacle on mountain side, 47° 51′

Station No 49 (Mass-kan), 1921—Northeast of small native village Mass-kan at Holy Cross Bay, 60 meters north of newer and farther of two houses belonging to traders

Station No 50, 1921—At middle of entrance to broad valley running north from east end of sand-spit on south side of low ridge closing eastern part of entrance, sand-spit is about 70 kilometers long and extends eastward off coast from Holy Cross Bay

Station Nos 51 and 52, 1921—No descriptions

Station No 53 (Pitlekai), 1921—Approximately same as observatory station occupied by A E Nordenskiold during wintering of the *Vega,* 1878-79, close to native tent-village Pitlekai, about 100 meters from top of mound and 60 meters from shore, this being location of observatory pointed out by old native woman, according to natives, Nordenskiold had left pole with an inscription here, but nothing was found of it Coast here is generally very low, with few low mounds on which native tents are placed

Station No 54 (Kain-ge-skon), 1922—Practically a re-occupation of stations Nos 22 and 42 of 1921, being, however, 6 meters west of the large whale-vertebra

Winter-Quarters, 1918-19—See No 4

Winter-Quarters, 1919-20—See No 21

Winter-Quarters, 1920-21—See No 41

Yan-dang-ai, 1921—See No 43

STRAITS SETTLEMENTS

Singapore, Botanical Gardens, 1921—On east shore of Cluny Lake, about 70 feet (21 meters) northwest of 1918 station True bearing left edge of large residence north of lake, 600 feet (183 meters), 161° 37′ 0

Singapore, Holland Road, 1921—About one-half mile (0 8 km) east of C I W station of 1918, on flat summit of small hill rising directly from south side of Holland Road, about midway between milestones 5¼ and 5½ from Singapore, opposite private road of Block E of U P Rubber Estate, and 23 paces from western

ASIA

STRAITS SETTLEMENTS—*concluded*

Singapore, Holland Road, 1921—continued
crest of hill True bearings prominent tall tree on hill, 2 miles (3 2 km), 33° 43′ 3, top of telegraph-pole on Holland Road with double insulators, 250 feet (76 meters), 218° 50′ 0, flagstaff on residence of Sultan of Johore, 2 miles (3 2 km), 276° 54′ 0, flag-staff on Mount Faber, 4 miles (6 km), 324° 55′ 6

Singapore, Observatory, 1921, 1923—On summit of Mount Faber, about 2 5 miles (4 0 km) southwest of town, near docks, on west side of roadway on summit of hill, about midway between signal station and observatory residence, and 67 8 feet (20 67 meters) south of telephone-pole, over block of granite, 11 by 3 inches (28 by 8 cm), projecting 19 inches (48 cm) above surface of ground, southeast face of which is inscribed with letter "M" painted red, a small hole 2 5 inches (6 cm) from southwest side of top face indicating exact point True bearings telephone-pole, 165° 00′ 4; top of Fort Canning lighthouse, 3 miles (5 km), 229° 26′ 3, top of steeple of St Andrews Cathedral, 3 miles (5 km), 234° 42′ 8, top of tower of town hall, 2 5 miles (4 km), 239° 26′ 8

SYRIA (INCLUDING PALESTINE)

(Note Earlier occupations of repeat stations in this section are included under Turkish Empire in Volume I of this series)

Aleppo, Aleppo, 1922—About 400 meters west of C I W station of 1910, site of which was covered with military structures, in park called Sebil, north of city, on east side of Aleppo-Alexandretta Road, behind stone structure used as café, on outcrop of rock partly covered with soil, 32 5 meters west of stone building, 7 40 meters east of west wall of inclosure, and 26 15 meters north of south wall, marked by block of stone 30 centimeters square, embedded in shallow layer of soil, the exact point marked by shallow hole in top of stone True bearings flagstaff on officers' quarters, new barracks, 218° 32′ 2, minaret of old Turkish barracks, 289° 33′ 3, minaret of Lulkubire mosque, with large dome, 316° 19′ 4, minaret of Akaba mosque, most westerly in town, 337° 33′ 7

Alexandretta, Adana, 1922—About 2 5 kilometers southwest of C I W station of 1910, site of which is now occupied by military warehouses and railway tracks, on estate of Mr Cattoni on Aleppo Road, just beyond Orthodox cemetery and Church of St George, in open field, about 75 meters west of inclosure surrounded by ancient wall said to be a fortification built by Alexander the Great, 22 paces north of shallow ditch separating two fields, and 24 7 meters 10° north of west from corner of a cow-shed, marked by tent-peg driven flush with ground True bearings signal-tower on lighthouse, 162° 38′ 8, cross on tower of Roman Catholic church, 203° 44′ 4, minaret in town, 219° 11′ 2

Damascus, 1922—Close reoccupation of C I W station of 1910, southeast of city, on plain lying between Greek Catholic cemetery and large olive grove, both inclosed by mud walls, in southeast corner of plain, 25 meters east of northeast corner of large stone vault in ancient neglected cemetery situated on hill rising abruptly from plain, 15 5 meters north of northwest corner of mud wall, 11 6 meters northwest of two large stones that serve as foot-bridge across irrigation ditch, and 2 8 meters west of ditch, marked by black stone, 19 by 22 by 50 centimeters,

ASIA

SYRIA (INCLUDING PALESTINE)—*Concluded*

Damascus, 1922—continued
its upper end 2 inches (5 cm) below surface of ground, the exact point being marked with a drill-hole in center of upper end True bearings cross on mausoleum in cemetery, 120° 36′ 4, minaret of Grand Mosque, 122° 55′ 9

Homs, 1922—Practical reoccupation of C I W station of 1910, on plain between railroad station and citadel, a huge earth fortification in southern part of town, in plowed field, east of railroad station, and southwest of cross-roads and fountain in middle of road leading from Homs to railroad True bearings central line of light seen through chimney cap on railway buffet building, 82° 07′ 1, tip of large square minaret, 225° 33′ 9, smaller square minaret seen almost over corner of wall of south inclosure, 242° 49′ 3

Jerusalem, 1922—Close reoccupation of C I W station of 1910, on road leading to Mount of Olives, in southern part of field belonging to American Colony, about 400 yards (366 meters) almost due east and back of Sheikh Jera'ah Mosque, about 200 yards (183 meters) northeast of Mohammed Salah's house, 31 7 meters northwest of east corner of stone wall inclosing field, 16 meters north-northwest of corner of wall, and 65 paces east-northeast of corner of wall True bearings minaret, 89° 20′ 4, staff on distant spire, 92° 26′ 2, German hospice tower, 284° 25′ 1, Russian tower on Mount of Olives, 308° 44′ 4

TURKEY

Afiumkarahissar, Brusa, 1922—Close reoccupation of C I W station of 1910, about 1¼ miles (2 km) east of railroad station, northwest of road leading from railroad station to marble quarries, and on east bank of small muddy, sluggish stream called Akar, 4 60 meters south of edge of stream, and 8 20 meters southwest and 17 80 meters east, respectively, of stumps of willow trees in former row extending along bank of stream, marked by square gray stone 20 centimeters on a side and 55 centimeters deep, projecting about 4 centimeters above ground, a drill-hole marking exact point True bearings minaret on mosque with double dome in Afion, 67° 50′ 1, tip of last vertical rock of spur of rock extending into plain to west of town, 111° 38′ 3, minaret in Sipsin, 158° 58′ 4

Aidin, Smyrna, 1922—North of town of Aidin, on west bank of small stream called Evthon, about 24 5 meters west of site of 1910 station which is now in stream-bed, 8 2 meters northwest of end of remnant of stone wall, 11 4 meters southeast of entrant angle at base of retaining-wall under cliff, and 38 90 meters southwest of large plane tree near south end of ruins of coffee-house True bearings end of cemetery wall on cliff, 261° 50′ 2, north edge of wooden house across stream, 280° 05′ 3, portion of east edge above dormer-window of first house east of ruins of municipal building (Konak), 357° 34′ 8

Dardanelles, Bigha, 1922—Practical reoccupation of C I W station of 1910, about 2 5 miles (4 km) south of town, on east side of road which follows shore of strait to this point and then continues south through country, on plateau about 300 meters east of main road, about 30 meters from place where hill begins to slope toward road, west of top of high hill whose magnetic bearing is 260°, and 24 3 meters, 29 9 meters, and 26 2 meters from three trees, whose magnetic bearings are 250°, 305°, and 55°, respectively, marked by a stone roughly triangular, about

ASIA

TURKEY—*concluded*

Dardanelles, Bigha, 1922—continued
20 centimeters on a side, 25 centimeters deep, set flush with ground, sharp point of triangle marking point True bearings minaret in village, 32° 27′ 6, tip of land at European side of entrance to strait, at water-line, 69° 02′, clock-tower in Dardanelles, 180° 16′ 4, northwest corner of farmhouse, 600 meters, 283° 01′

Smyrna, Smyrna, 1922—Close reoccupation of C I W station of 1910, in suburb called Bairakli, south of house of Elias Petroklilos, east of retaining-wall of dry stones, and north of rock-bordered path leading to house of Vredos Petroklilos, just southeast of threshing-floor, and 18.20 meters west and 5 05 meters northwest, respectively, of olive trees True bearings church tower in Smyrna, 35° 06′ 2, tip of dome on church, 35° 29′ 9, notch between twin peaks across gulf, 56° 04′ 1, iron cross on church on Bairakli, 118° 41′

AUSTRALASIA

AUSTRALIA

Adelaide (Botanical Park), South Australia, 1923—Close reoccupation of C I W station of 1911 In Botanical Park, about 280 yards (256 meters) from Botanical Gardens, about 220 feet (67 meters) east of top of river bank, 256 feet (78 0 meters) northeast of large blue-gum tree, 84 8 feet (25 84 meters) northeast of left edge of bench near Victoria Drive, 136 2 feet (41 51 meters) south of lone white post near drive, and about 860 feet (262 meters) south from iron gates on opposite side of road from park gates, marked by wooden peg driven flush with ground True bearings center of hole in blue-gum tree, 34° 50′ 7, left edge of left bench support, 62° 73′ 5, left edge of left bench support across road, 123° 23′ 7, near corner of base of lone white post near road, 184° 17′ 4, near corner of first stone fence-post to left of gate across Hackney Road, 210° 50′ 7

Albury New South Wales, 1922—Close reoccupation of C I W station of 1913, in Botanical Gardens on open green with many trees, lying between Dean Street and bowling-green, 70 feet (21 3 meters) from row of trees south of walk parallel to Dean Street, 62 feet (18 9 meters) and 78 feet (23 8 meters) respectively from nearest points of paths to northwest and southeast, 72 5 feet (22 10 meters) from water-tap near edge of path to northwest, and 100 6 feet (30 66 meters) from water-tap to east-southeast True bearings top of flagstaff seen on bowling-green club-house, about 250 feet (76 meters) 35° 30′ 1, top of standpipe on last house to left of row on hill, 69° 15′ 9

Ararat, Victoria, 1923—Station of 1911, was closely reoccupied near center of recreation grounds of asylum east of concrete cricket-pitch and 39 5 feet (12 0 meters) and 67 feet (20 4 meters) from its north and south ends respectively, marked by tent-peg driven flush with surface of ground True bearings center of white railway-crossing post one-third mile (0 5 km), 17° 21′ 5, gable of brick building, one-fourth mile (0 4 km), 86° 43′ 3 flagpole on asylum tower 248° 15′ 8, near chimney on stone building, 308° 10′ 1

Batchelor Northern Territory, 1923—Exact reoccupation of C I W station of 1914 and close reoccupation of C I W station of 1912 On ridge south of government experiment farm, about 150 yards (137 meters) southeast of ruins of men's quarters, about 100 yards (91 meters) northwest from manager's old quarters, 15 feet (4 6 meters) south of old buggy track, and 9 5 feet (2 9 meters) northwest of tall tree marked with cross 6 feet (1 8 meters) above ground, marked by cement block 9 by 9 inches (23 by 23 cm), with "C I W 1914" on top and covered with cairn of stones True bearings top of center gable of stable, 134° 49′ 3, right gable of stable, 138° 41′ 9, leftmost ornament on manager's house, one-fourth mile (0 4 km), 148° 45′ 5

Border Town, South Australia, 1923—Station of 1916 was closely reoccupied on race-course reserve just east of track, 105 paces southeast of No 1 furlong post, 143 paces northeast of No 2 furlong post, 210 yards (192 meters) southwest of 182½-mile post on railway, and 220 yards (201 meters) from near rail of railway, marked by 2 by 4-inch (5 by 10 cm) post left 6 inches (15 cm) above ground True bearings center, near ground, of distant railway signal-post, 235° 57′ 1, center of 182½-mile post, 245° 20′ 9, north corner post of small cemetery surrounded by iron railings, 267 paces, 303° 22′ 6

Bourke, New South Wales, 1923—Close reoccupation of C I W station of 1913, in water-works reserve, on bank of Darling River, between Cullie and Cobar streets, 50 feet (15 2 meters) from southeast fence, 87 5 feet (26 67 meters) from east corner at Cullie and Wartumurtie streets and about 230 feet (70 meters) northeast of water-tower, marked by tent-peg True bearings left edge of chimney of engineer's cottage, 36° 10′ 8, center bottom of left support of water-tower, 67° 34′ 3, center of chimney of pump-house, 101° 13′ 0, near chimney of house, one-fourth mile (0 4 km), 340° 36′ 8

Brisbane, Queensland, 1922—Exact reoccupation of C I W station of 1913 and 1914, in Victoria Park, on slope below Children's Hospital, 206 5 feet (62 94 meters) from corner of Children's Hospital fence at intersection of streets and 263 7 feet (80 38 meters) from southeast corner of Courrier Ward of hospital, marked by sandstone post 6 by 6 by 15 inches (15 by 15 by 38 cm), sunk 1 inch (3 cm) below ground, and lettered on top "C I W 1913" True bearings right cross on convent, one-half mile (0 8 km), 6° 17′ 1, edge of fence bounding Children's Hospital at intersection of streets, 155° 01′ 0, southeast edge of Courrier Ward, 196° 12′ 2, center top of rear tower of museum, one-fourth mile (0 4 km), 294° 41′ 8, top of St Paul's Church steeple, three-fourths mile (1 2 km) 350° 57′ 8

Broken Hill, New South Wales, 1923—Exact reoccupation of C I W station of 1911, west of town, about 1 mile (1 6 km) from post-office and one-half mile (0 8 km) north of Silvertown Tramway's Sulphide Street station, 25 2 feet (7 68 meters) south of center of western football-oval, 320 feet (97 5 meters) east of pavilion, 214 feet (65 2 meters) and 157 feet (47 9 meters) respectively, southeast and northwest from asphalt cycle-track encircling football-oval, and 288 feet (87 8 meters) southwest of right goal-post, marked by jarrah peg 2 by 3 by 20 inches (5 by 8 by 51 cm), driven flush with surface of ground True bearings right edge of north railway water-tank, one-half mile (0 8 km), 34° 26′ 8, gable and flagstaff on pavilion, 96° 41′ 5, near gable of stone house on hill, one-fourth mile (0 4 km), 163° 51′ 4, right edge of right goal-post, 223° 47′.1

AUSTRALASIA

AUSTRALIA—*continued*

Broome, A, Western Australia, 1921—Close reoccupation of C I W station of 1914, in low scrub about one-fourth mile (0 4 km) west of jetty and one-half mile (0 8 km) south of wireless station, 204 feet (62.2 meters) from west end of north arm and 210 feet 64 0 meters) from west end of south arm respectively of cattle lead joining cattle race on jetty True bearings wireless mast, 171° 25′ 7, near gable of large red building, one-half mile (0 8 km), 226° 09′ 8, signal-mast on shore, one-third mile (0.5 km), 239° 14′ 9

Bunbury, A, Western Australia, 1921—About 80 feet (24 4 meters) west of C I W station of 1914, and about 116 feet (35 4 meters) west of that of 1912, on grassy thoroughfare connecting Wellington and Princep streets, between Roman Catholic reserve and public cemetery, at a point 27.5 feet (8 38 meters) and 23 4 feet (7 13 meters) from fences on east and west sides, of thoroughfare, respectively, 79.3 feet (24 17 meters) from northeast corner of cemetery fence, and 53.25 feet (16 23 meters) from fence post on top of rise to north, marked by jarrah stake, 3 by 2 by 12 inches (8 by 5 by 30 cm), driven 1 inch (3 cm) below surface of ground True bearings west spike on pavilion in showgrounds, one-fourth mile (0 4 km), 164° 41′ 6, top of lighthouse tower, three-fourths mile (1 km), 195° 21′.2, bottom of flagstaff at signal-station, three-fourths mile (1 km), 196° 34′ 8, southwest corner of Roman Catholic reserve, 350° 48′ 3

Bunbury, B, Western Australia, 1921—Near middle of recreation ground at Forrest Park, a large open space surrounded by wooded bush, about 1 5 miles (2 4 km) southeast of town, 24 5 feet (7 47 meters) east of southeast corner of and in line with south edge of cement cricket-pitch in center of park, marked by jarrah stake, 2 by 2 by 24 inches (5 by 5 by 61 cm), its top face left about 1 inch (3 cm) below sod True bearings southeast corner of cricket-pitch, 75° 43′, bottom of southmost support of scoring-board, 150 yards (137 meters), 80° 18′.5, leftmost of two ventilators on roof of red building, one-half mile (0.8 km), 120° 32′ 6, southwest veranda-post of sports pavilion, 133 paces, 138° 06′ 8, northmost veranda-post of house behind large tree, 315° 55′ 4

Burra, South Australia, 1923—In part of Burra known as Kooringa, in football-ground owned by the corporation, 100 7 feet (30 69 meters) from northeast wall, 106 0 feet (32 31 meters) from southeast wall, 137 8 feet (42 00 meters) north of near gate-post of gate in southeast wall, 58 4 feet (17 80 meters) east of notched post in fence surrounding oval, and 37.8 feet (11 52 meters) northwest of nearest pine tree, marked by 2 by 3 inch (5 by 8 cm) jarrah peg, left flush with soil, a copper nail-head marking exact point True bearings gable end of house, three-fourths mile (1.2 km), 7° 18′ 4, ornament on left end of lower school building, 900 feet (274 meters), 71° 12′ 7, center of right-hand post of main gate, 275 feet (83 8 meters), 90° 57′.3, center of near face of chimney of old smelter, one-fourth mile (0 4 km), 108° 20′.8, gable of large shed in football-ground, 450 feet (137 meters), 149° 11′.9, top of southeast corner of walls, 146 1 feet (44 53 meters), 284° 44′ 6

Cairns, Queensland, 1923—Close reoccupation of C I W station of 1912, on southwest outskirts of town, on lot No 167, reserved for recreation ground, at corner of Alpin and Severn streets, west of cement cricket-pitch, 124.2 feet (37.86 meters) and 138.5 feet (42 21 meters), respectively, southwest and west of nearest corners, marked by wooden peg driven just below surface of ground True bearings near corner of house east of Severn Street, 900 feet (274 meters), 162° 55′ 0, near corner of anteroom of corner house, 300 feet (91 meters), 210° 09′ 0, spike on top of harbor lighthouse, 1½ miles (2 4 km), 286° 25′ 5, left edge of left iron support of city gas-tank, 1½ miles (2 4 km), 288° 08′.2

Carnarvon, Western Australia, 1921—Close reoccupation of C I W station of 1914, on town common on north side of creek, about 800 feet (244 meters) north-northeast of Gascoyne Hotel, 64 paces from north end of small foot-bridge over creek along line from right edge of Gascoyne Hotel True bearings right gable of Gascoyne Hotel, 24° 15′ 0, top of lighthouse tower, 3 miles (5 km), 103° 06′ 0, spike on red-roofed house, two-thirds mile (1 km), 268° 38′ 4

Ceduna, South Australia, 1923—Close reoccupation of C I W station of 1911, on small sand rise about one-fourth mile (0 4 km.) south of hotel, about one-half mile (0.8 km) north of railway station, 94.5 feet (28.80 meters) west of road-peg numbered "13-14," and 147 feet (44 81 meters) northwest of road-peg numbered "14-21" True bearings near gable of house painted black and white, 2 miles (3 km), 42° 21′ 7, center of mooring-post on end of jetty, one-third mile (0 5 km), 133° 33′ 0, ornament on front gable of Murat Bay Hotel, 177° 46′ 9, center of steeple on Methodist church, 189° 49′ 4

Charleville, Queensland, 1922—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1913, now on private property between Edward and Galatea streets, in second lot facing Edward Street southwest of Mr McWha's house, 186 feet (56 7 meters) from survey-peg at southeast corner of Mr McWha's property, 5.3 feet (1 62 meters) northeast of west wooden fence, 31.2 feet (9.51 meters) southeast of north wooden fence, and 61 feet (18 6 meters) southwest of east wire fence, marked by hardwood peg sunk just below ground True bearings left edge of house, 174° 36′ 9, gable of brown house, 250 feet (76 meters), 250° 26′ 6, outer edge of right veranda-post, 250 feet (76 meters), 306° 21′ 6, top of telegraph-pole, 1,200 feet (366 meters), 322° 12′ 1

Station *B* is on football-grounds, near northeast street entrance, 94 0 feet (28 65 meters) southwest of center of south post of wagon gate, 83 7 feet (25 51 meters) southwest of post in fence-line and 18 0 feet (5 49 meters) northeast of post of inner fence of football-field, both posts and station being in line with fence on southeast side of street leading to wagon gate, and 44.8 feet (13 65 meters) east of water-pipe, marked by tent-peg driven flush with ground True bearings left edge of house on piles, 500 feet (152 meters), 94° 27′ 5, left gable of brown and white house seen over fence, one-half mile (0.8 km), 161° 47′ 9, north veranda-post (center) of Mr McWha's house near C I W station of 1913, one-fourth mile (0 4 km), 186° 43′ 8, left corner of top of first telegraph-pole on street leading to wagon gate 400 feet (122 meters), 233° 02′.3, left gable of brown house, 300 feet (91 meters), 340° 27′ 7

Cloncurry, Queensland, 1923—Two stations were occupied Station *A* is close reoccupation of C I W station of 1913, on southeast end of town reserve, north of

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Cloncurry, Queensland, 1923—continued
cemetery, and west of Sheaffe Street, 396 feet (120 7 meters) northeast of northwest corner and 530 feet (161 5 meters) northwest of northeast corner of cemetery reserve, marked by peg True bearings east gable of cottage, one-half mile (0 8 km), 28° 23′ 6, near gable of cottage, one-fourth mile (0 4 km), 59° 37′ 5, left gable of engine shed, 298° 33′ 5, left gable of railway station, 320° 23′ 2, center of cross on Catholic church, 450 yards (411 meters), 336° 56′ 2

Station *B* is 191 paces west of station *A*, 97 6 feet (29 75 meters) east of small tree, 238 6 feet (72 72 meters) southeast of southeast corner of fence inclosing city pound, and 299 feet (91 1 meters) south-southeast of survey-peg "P-R", marked by peg True bearings near gable of cottage, one-fourth mile (0 4 km), 27° 52′ 5, east edge of sign-board on pound fence, 107° 40′ 7, Station *A*, 275° 48′ 5, center of lone tombstone near north side of cemetery, 307° 34′ 9

Cook, South Australia, 1921—On flat limestone plain, 1,000 feet (304 8 meters) north of east-west railway line, marked by peg and cairn of stones True bearings east edge of tank over artesian bore, 26° 53′ 8, center of gable of large engine supply-tank opposite railway station, 360 paces, 41° 40′ 3, distant signal, 71° 01′ 8, north edge of galvanized iron carriage-shed, 134° 04′ 3, center of top of distant signal-post, 281° 32′ 2, northeast edge of elevated iron tank, 286° 17′ 7, near signal east of railway station, 330° 27′ 2, right edge of signal-wire post, 358° 36′ 7

Cooktown, Queensland, 1923—Close reoccupation of C I W station of 1912 and 1913 On open grassy slope east of town between lines of Hogg and Howard streets, 44 feet (13 4 meters) from charred milk tree, and 453 feet (138 1 meters) east-southeast from southeast corner fence-post of house in block between Garden and Kimberly streets, marked by a 7 by 7 by 18 inches (18 by 18 by 46 cm) cement block left level with the surface, with inscription "C I W 1923" cut on top and covered by cairn of stones True bearings peak of roof of house on hill, 1 mile (1 6 km), 26° 07′ 4, center of gable on hospital veranda, one-half mile (0 8 km), 62° 28′ 4, southwest corner of house, 470 feet (143 meters), 122° 20′ 1, center of right ventilator on State School, three-eighths mile (0 6 km), 152° 16′ 4, base of flagstaff on Grassy Hill, one and one-half miles (2 4 km), 181° 28′ 1

Coolgardie, Western Australia, 1921—Close reoccupation of C.I W station of 1912, in reserve lands on north side of town, in section bounded by Toorak, Moran, MacDonald, and Jobson streets, 117 8 feet (35 91 meters) southwest and 111 6 feet (34 02 meters) northwest of centers of two prominent gum trees respectively, marked by a tarred jarrah peg sunk 2 inches (5 cm) below surface of ground True bearings right edge of reservoir on hill, one-half mile (0 8 km), 213° 00′ 2, left gable of Presbyterian church, one-fourth mile (0 4 km), 299° 32′ 0, cross on right gable of Catholic church, one-fourth mile (0 4 km), 330° 07′ 1, center of cross of left gable of convent, one-fourth mile (0 4 km), 345° 28′ 0

Coongoola, Eclipse, Queensland, 1922—In town reserve section of large open paddock northwest of Coongoola railway station, 675 feet (205 7 meters) southwest of survey peg at northwest corner of Block I, Lot 10, and 674 feet (205 4 meters) northwest of survey peg at northwest corner of Block II, lots 10 and 11 marked by a 4 by 4 inch by 3.5 feet (10 by 10 by 107 cm) cypress post left 1 inch (3 cm) above surface of ground, with letters "C I W, 1922" burned upon top, a hole marking exact station center True bearings middle of railway signal-pole, one-third mile (0 5 km), 224° 22′ 8, survey peg corner of Block I, 241° 46′ 6, left edge of railway ware-shed, 1,200 feet (366 meters), 289° 14′ 5, north gable of railway station, 1,500 feet (457 meters), 307° 39′ 5, survey peg corner of Block II, 310° 54′ 2

Cordillo Downs, South Australia, 1922—Close reoccupation of C.I W station of 1914, on low, flat ground east of water-course of Pollatuckera water-hole, 150 feet (45 7 meters) south of cleared track to Arabury, and 300 feet (91 meters) east of east edge of water-course, marked by mulga peg projecting 3 inches (8 cm) above ground and surmounted by pile of stones 1 foot (30 cm) high and 2 feet (61 cm) in diameter True bearings north side of small window of wool-shed, one-third mile (0 5 km), 99° 21′ 3, foot of southern aerial mast, one-fourth mile (0 4 km), 108° 50′ 6, center of concrete pier near homestead, one-fourth mile (0 4 km), 117° 41′ 2, foot of northern aerial mast, one-fourth mile (0 4 km), 118° 17′ 2, near corner of chimney of homestead, 1,500 feet (457 meters), 121° 44′ 4, south side of chimney stack of wool-scouring plant, 1,200 feet (366 meters), 126° 48′ 2, pumping-rod of northern windmill, one-fourth mile (0 4 km), 127° 57′ 6

Croydon, Queensland, 1923—Exact reoccupation of C I W station of 1912, on unoccupied ground between hospital and race-course reserves, about three-fifths mile (1 km) south of railway station, marked by new peg 3 by 2½ by 18 inches (8 by 6 by 46 cm) True bearings southeast corner of hospital fence, 342 feet (104 2 meters), 68° 09′ 7, ventilator on top of hospital, 108° 55′ 0, northeast corner of hospital fence, 385 feet (117 3 meters), 149° 34′ 5, right edge of railway water-tank, 168° 43′ 0, center of mine chimney, 210° 6′ 9, east gable of school, 223° 01′4

Cottesloe, A, Western Australia, 1921—Exact reoccupation of C I W station of 1914, in Government Educational Endowment Reserve, northeast of junction of Grant and Marmion streets, 240 5 feet (73 30 meters) northeast of sign-post at southwest corner of reserve, and 160 2 feet (48 83 meters) north of telegraph-pole on north side of Grant Street True bearings edge of fence near quarry, three-fourths mile (1 km), 23° 26′ 6, top of sign-post at corner of Grant and Marmion streets, 51° 36′ 6, spike of front gable of house on hillside, one-third mile (0 5 km), 120° 40′ 6, ornament on roof of nearby house, 150 yards (137 meters), 263° 13′ 5

Cunnamulla, Queensland, 1922—Exact reoccupation of C I W station of 1913, in southwest corner of race-course reserve, 343 5 feet (104 70 meters) from southwest corner, marked by hardwood peg driven flush with ground True bearings southwest corner of reserve, 72° 44′ 0, center of near cross on church, 1 3 miles (2 km), 80° 59′ 0, right gable end of F Hobson and Company's store, 1 mile (1 6 km), 90° 38′ 4, left end of tower on roof of store, 1 mile (1 6 km), 100° 37′ 9, near gable of railway shed, three-fourths mile (1 2 km), 135° 26′ 8, northwest corner of race-course reserve, one-half mile (0 8 km), 185° 37′ 4, southeast corner of reserve, 285° 45′ 0

Darwin, Northern Territory, 1923—Close reoccupation of C I W station Port Darwin of 1912 and Darwin of 1914 West of Botanical Gardens and near north

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Darwin, Northern Territory, 1923—continued end of Mindil Beach, 55 feet (16 8 meters) northwest of center of old road running southwest through avenue of coconut palms measured from a point in center of roadway 62 feet (18 9 meters) southwest of intersection with center of roadway running southeast, 121 6 feet (37 06 meters) southwest of V-marked jungle tree, and 133 5 feet (40 69 meters) north of northmost coconut palm, marked by a 10 by 10 by 36 inches (25 by 25 by 91 cm) concrete pier labeled "C I W 1923," with a bamboo pipe embedded to mark exact center True bearings center of ventilator on house at Milly Point, 1 mile (1 6 km), 36° 31′ 2, center of Point Charles Lighthouse, 15 miles (24 km), 105° 06′ 2, extreme edge of East Point, 2½ miles (4 km), 153° 30′ 4, center of near iron post of road culvert, one-fourth mile (0 4 km), 234° 21′ 4

Deakin, Western Australia, 1921—On flat limestone plain north of east-west railway-line, northeast of Deakin railway siding, and 255 4 feet (77 85 meters) true north of center mark of portable-transit pier, 3 by 2 by 1 5 feet (0 9 by 0 6 by 0 46 meter), the westernmost of three slate-topped concrete piers 20 feet (6 1 meters) north of railway-line used in determination of boundary in 1921 between South Australia and Western Australia, marked by peg and small cairn of stones

Derby, Western Australia, 1921—Close reoccupation of C I W station of 1914, on flat, open ground northeast of Derby Hotel, in line with front edge of northwest balcony of hotel, and in range with two posts 8 feet (2 4 meters) high and about 500 feet (152 meters) apart, marking race-course track True bearings bottom of near post of race-course, 350 feet (107 meters), 239° 49′ 5, right edge of water-tank, 1 5 miles (2 4 km), 309° 55′ 3

Dubbo, A, New South Wales, 1923—Close reoccupation of C I W station of 1913, near New South Wales astronomical station, on top of rise about 1 5 miles (2 km) west of town, in paddock south of main road which crosses Macquarie River, marked by hardwood peg left 2 inches (5 cm) above ground and covered with cairn of stones True bearings astronomical station, 129 5 feet (39 47 meters), 34° 23′ 0, trigonometric station, 10 miles (16 km), 248° 41′ 5, near corner of brewery, 2 miles (3 km), 326° 22′ 3

Dubbo, B, New South Wales, 1923—Close reoccupation of C I W station of 1913, in park southwest of Great Western Hotel, 288 5 feet (87 93 meters) southwest of northeast corner and 154 feet (46 9 meters) west of east fence of park, marked by peg True bearings east gable of high-school, one-fourth mile (0 4 km), 7° 56′ 6, white pole in front of house, one-fourth mile (0 4 km), 37° 14′ 4, right edge of northwest chimney of railway station, one-fourth mile (0 4 km), 129° 26′ 2, left edge of lamp-post at northeast corner of park, 219° 59′ 2

East Maitland, New South Wales, 1921—Close reoccupation of C I W station of 1913, in east half of large park on rise in southern part of town, south of south corner of William and Park streets, 397 feet (121 0 meters) from north corner post of park, and 226 feet (68 9 meters) from northwest fence, marked by peg driven flush with ground True bearings near gable on former church, one-fourth mile (0 4 km), 25° 18′ 2, lamp-post at north road corner of Rouse and

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East Maitland, New South Wales, 1921—continued William streets, 117° 41′ 0, belfry of Anglican church, 500 feet (152 meters), 170° 48′ 8, center of north corner park post, 200° 21′ 8, center of ornament on front of Wesleyan church, 1,000 feet (305 meters), 209° 48′ 0, center of bottom of cross on near end of Catholic church, one-fourth mile (0 4 km), 257° 44′ 2

Edithburgh, South Australia, 1924—Exact reoccupation of C I W station of 1911 In triangular shaped portion of park land immediately west of township, 700 yards (640 meters) west-northwest of large stone house near jetty, 300 yards (274 meters) north-northwest of stone shop on corner of main street, 131 feet (39 9 meters) northeast of hedge fence bordering Yorketown road, approximately 350 feet (106 7 meters) west of wire fence along street to eastward, marked by jarrah peg sunk a little below surface True bearings brick corner of white-roofed house, 200 yards (193 meters), 108° 14′ 1, east gable of public school, 400 yards (357 meters), 211° 05′ 8, spire of Anglican church, 272° 18′ 3, ornament on large stone house near jetty, 700 yards (640 meters), 293° 52′ 3, gable ornament on institute, 400 yards (356 76 meters), 325° 39′ 5

Emerald, Queensland, 1922—Practical reoccupation of C I W station of 1913, in public park reserve containing race-course, 252 2 feet (76 87 meters) from southwest corner of reserve, and 217 6 feet (66 32 meters) from spike in foot of post at small gate opposite hospital, marked by tent-peg driven flush with ground True bearings center of veranda post on house, one-fourth mile (0 4 km), 14° 40′ 2, top of left center ventilator on hospital, 300 feet (91 meters), 67° 22′ 4, right edge of back of grandstand, 250 feet (76 meters), 295° 03′ 5, near gable of house, three-fourths mile (1 2 km), 345° 00′ 8

Eucla, Western Australia, 1923—Close reoccupation of C I W station of 1911 and 1914, on open ground east of settlement, 192 8 feet (58 76 meters) east of corner of fence opposite old telegraph offices and quarters, about 300 feet (91 meters) southeast of near corner of billiard-room, and about 1 foot (0 3 meter) south of point in range with east-west fence, marked by tent-peg driven flush with sand True bearings northwest corner of goods-shed on sand-hills, one-fourth mile (0 4 km), 18° 12′ 0, front gable of Mr Tonkin's house, one-fourth mile (0 4 km), 97° 43′ 2, near corner of billiard-room, 149° 40′ 6

Farina, A, South Australia, 1923—Exact reoccupation of C I W station of 1911 and 1914 On small knoll in northeast corner of police paddock west of town, about 1 mile (1 6 km) west of railway station, about one-half mile (0 8 km) due west of Exchange Hotel, 594 feet (181 meters) west of east fence of paddock, and 637 feet (194 2 meters) from north fence, marked by jarrah peg left flush with ground and surmounted by a small cairn of stones True bearings gable of pump-house, one-fourth mile (0 4 km), 230° 10′ 5, west gable of public school, 279° 56′ 8, west gable of English church, 288° 56′ 8, west gable of red-roofed house, 1 mile (1 6 km), 312° 13′ 4

Forsayth, Queensland, 1923—Practical reoccupation of C I W station of 1912, on open country northwest of township, between terminus of railway and school-house, northeast of two high knobs at west end of range of hills, south of school gully, 7 paces west from center of Georgetown Road, and 100 paces northeast of Joe Lee's stock-yard, marked by a gum-

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Forsayth, Queensland, 1923—continued tree post 4 by 4 by 60 inches (10 by 10 by 152 cm) left 2 feet (0 6 meter) above ground True bearings left ventilator on schoolhouse, one-half mile (0 8 km), 132° 39′ 2, near gable of Mr Fitzsimmon's house, one-fourth mile (0 4 km), 218° 59′ 0, left veranda-post of Goldfields Hotel, one-half mile (0 8 km), 296° 10′ 2

Geraldton, Western Australia, 1921—Near the C I W station of 1912, over jarrah peg 3 5 inches (9 cm) square, projecting 2 feet (0 6 meter) above ground, on summit of broken sand ridges opposite public cemetery, on east side and southeast of north end of Eastern Road, about 80 yards (73 meters) east of northeast corner of cemetery, and about 15 yards (14 meters) southwest of sandy cart-track leading southeast from north end of Eastern Road True bearings bottom of left side of base of water-tank, 1 mile (1 6 km), 11° 55′ 1, westmost peak of range, 10 miles (16 km), 179° 54′ 4, near gable end of red-roofed shed on hillside, one-half mile (0 8 km), 221° 24′ 8, telegraph-pole, 50 feet (15 2 meters), 237° 33′ 6

Goondiwindi, Queensland, 1922—Two stations were occupied Station *A* is exact reoccupation of E Kidson's eclipse station of September 21, 1922, near southwest corner of recreation park, 105 5 feet (32 16 meters) northeast of corner post, 66 feet (20 1 meters) south-southeast of lone tree, and 105 4 feet (32 13 meters) southwest of near corner of brick pier of the Melbourne Observatory eclipse expedition, marked by white-wood peg driven flush with ground, surrounded by three redwood tripod pegs driven flush with ground True bearings ornament on roof of house, 200 feet (61 meters), 87° 17′ 6, center of ornament on front of house on corner, 400 feet (122 meters), 195° 16′ 6, center of top cross on convent, 1,000 feet (305 meters), 257° 45′ 3, center of near cross on convent, 258° 26′ 2, right edge of water-tank, 750 feet (229 meters), 272° 34′ 6, center of near ventilator on roof of house, 750 feet (229 meters) 344° 55′ 7

Station *B* is close reoccupation of C I W station of 1913, in northwest corner of race-course and show-ground reserve, 385 feet (117 3 meters) southeast of northwest corner post of reserve, 146 6 feet (44 68 meters) north-northeast of east post of corral gate, and 133 feet (40 54 meters) from permanent north-east corner post of corral, marked by peg True bearings center of left ventilator on railway station, one-fourth mile (0 4 km), 9° 51′ 4, near gable of barn, 200 feet (61 meters), 17° 52′ 4, center of north-west corner post of reserve, 153° 21′ 2, right ventilator on barn, one-fourth mile (0 4 km), 288° 02′ 5, near gable of grandstand, 200 feet (61 meters), 356° 18′ 4

Goulbourn, New South Wales, 1922—Close reoccupation of C I W station of 1913, in northeast half of Victoria Park, near west corner, 141 feet (43 0 meters) from center of hedge fence along street on north-west side of park, and 260 feet (79 2 meters) east of nearest gate-post at gate to street, marked by round wooden peg True bearings near corner of nearest gate-post, 78° 48′ 8, top of church spire, three-fourths mile (1 2 km), 279° 17′ 4, ornament on near gable of large yellow brick house on hill, about 1 5 miles (2 4 km), 326° 38′ 6

Harden, New South Wales, 1922—Practical reoccupation of C I W station of 1913, near southwest corner of Murrumburrah Park, 141 feet (43 0 meters) north-northeast of west wagon gate-post, in line with and 133 feet (40 5 meters) east of near corner of north tennis-court boundary fence, and 160 feet (48 8 meters) southwest of southwest band-stand support post, which stands in line with northeast post True bearings center of tall iron smoke-stack, about one-fourth mile (0 4 km), 83° 56′ 2, center of spire on Catholic church across valley, about one-fourth mile (0 4 km), 102° 06′ 5, ornament on top of band-stand, 236° 36′ 4, spike on wind-gage on Methodist church, about three-fourths mile (1 2 km), 341° 36′ 1

Hergott Springs, South Australia, 1922, 1923—See Marree

Hobart, D, Tasmania, 1923—Close reoccupation of C I W station of 1914, in inclosure near rear entrance to Government House, 120 feet (36 6 meters) north of north face of old hexagonal observatory, 79 feet (24 1 meters) and 70 7 feet (21 55 meters) northeast of south and east corners respectively of square sand-stone shed, 26 feet (7 9 meters) southwest of north-east wood boundary fence, 25 feet (7 6 meters) west of lone tree near gate, and 41 5 feet (12 65 meters) northwest of lock on right gate-post of gate opening into inclosure, marked by peg True bearings left edge of stone shed, 58° 19′ 3, right edge of antenna pole on hill, 1,700 feet (518 meters), 120° 36′ 7, near gable of small red house across Derwent River, 2 miles (3 km), 192° 36′ 0, near gable of large house across Derwent River, 2 miles (3 km), 193° 57′ 0

Hughenden, Queensland, 1923—Close reoccupation of C I W station of 1913, in large water reserve on west bank of Flinders River, 209 5 feet (63 86 meters) east from railway siding, 150 feet (45 7 meters) south-west of telegraph-pole, and 298 5 feet (91 0 meters) northwest of survey peg marked "R-R" at northwest corner of Uhr Street and street leading to hospital, marked by wooden peg driven flush with ground True bearings spike on water-tower, one-eighth mile 0 2 km), 11° 24′ 0, near gable of slaughter-house, 135° 03′ 2, survey peg "R-R," 299° 59′ 8, center of front cross on Roman Catholic church, one-third mile (0 5 km), 329° 05′ 0

Jericho, Queensland, 1922—Close reoccupation of C I W station of 1913, in stock and camping reserve, north of town, 244 feet (74 4 meters) northwest of north-west corner of fence inclosing railway grounds, and 473 feet (144 2 meters) from inclosure at Edison Street crossing, marked by tent-peg driven flush with ground True bearings end post of stock-loading chute, 700 feet (213 meters), 245° 02′ 5, spike on far end of railway station, 321° 49′ 8, near gable of railway station, 325° 13′ 8, left veranda-post of cottage, 750 feet (229 meters), 358° 42′ 6

Katanning, Western Australia, 1921—Exact reoccupation of C I W station of 1912, one-half mile (0 8 km) northeast of railway station, in recreation grounds (town lot 416) previously used as agricultural show-grounds, 150 5 feet (45 87 meters) from survey post at east corner, 103 5 feet (31 55 meters) from fence running northeast-southwest, and 55 0 feet (16 76 meters) from south corner of tennis-court True bearings top left edge of railway tank, one-half mile (0 8 km), 39° 28′ 8, bottom of flagstaff on turret of K G Hostel, one-half mile (0 8 km), 56° 37′ 4, south corner of fence around tennis-court, 65° 13′ 5

Katherine River, Northern Territory, 1923—Exact reoccupation of C I W station of 1912 and 1914 In

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Katherine River, Northern Territory, 1923—continued horse paddock of Katherine telegraph-station, 451 5 feet (137 62 meters) northeast of east corner of masonry tower supporting telegraph-wire, and 98 feet (29 9 meters) north of lone gum tree, marked by new wooden peg True bearings bottom of right iron pole on tower near office, 60° 58′ 5, right edge of iron pole on far tower across river, 93° 56′ 2, near gable of linesman's cottage, 500 feet (152 meters), 169° 16′ 2, west corner post of stockyard, 400 feet (122 meters), 196° 30′ 2

Latrobe, Tasmania, 1923—C I W station of 1914 was reoccupied in neighborhood of Tasmanian Magnetic Survey station in western part of race-course reserve, on north side of road to Deloraine, 18 5 feet (5 64 meters) east of right gate-post and 23 6 feet (7 19 meters) northeast of left gate-post of west fence, 54 6 feet (16 64 meters) northwest of small double-trunked wattle tree, and about 389 feet (119 meters) north of south fence, marked by peg True bearings right edge of rock on Mount Roland, 17 5 miles (28 2 km), 30° 05′ 6, left edge of chimney on double house, one-fourth mile (0 4 km), 76° 17′ 5, right edge of white cottage next to red cottage, one-fourth mile (0 4 km), 80° 40′ 6, left edge of red cottage on hill, taken near chimney, 2 miles (3 km), 110° 03′ 1

Leonora, Western Australia, 1921—Practical reoccupation of C I W station of 1914, about 4 miles (6 km) northwest of Leonora, near Lawlers Road, about one-fourth mile (0 4 km) northeast along Four-Mile Creek, between two arms of creek, on bank of south arm, 1,219 feet (372 meters) from east corner of foot of Four-Mile Well, marked by jarrah peg 5 5 by 3 inches (14 by 8 cm), standing 1 inch (3 cm) above surface, and lettered "C I W " True bearing left edge of leftmost tank on St George Hill, 166° 21′ 6

Longford, Tasmania, 1923—About 6 feet (2 meters) northeast of C I W station of 1913, in recreation-ground reserve, about 158 feet (48 meters) southeast of Tasmanian Magnetic station, a concrete block set 6 inches (15 cm) below ground, 187 5 feet (57 15 meters) south of south corner of dressing-shed, 185 5 feet (56 54 meters) southwest of fence corner near gate, and 225 0 feet (68 58 meters) west of fence corner south of almshouse, marked by sandstone block 3½ by 7 by 8 inches (9 by 18 by 20 cm), lettered "C I W 1923" on top, a hole marking exact station center, left flush with ground True bearings near corner of sports dressing-shed, 186° 54′ 0, near corner of fence near gate, 215° 08′ 8, near corner of almshouse, 350 feet (107 meters), 288° 32′ 2, right ledge of chimney on cottage, 331° 12′ 8

Lyndhurst Siding, South Australia, 1922—On flat ground northeast of Lyndhurst railway station, within station-yard reserve, and 43 0 feet (13 11 meters) south of notched post on northern boundary fence measured 247 feet (75 meters) along fence from railway-line, marked by aluminum peg sunk level with ground True bearings foot of telephone corner-post, 124 2 feet (37 86 meters), 29° 42′ 2, gable of ticket office 32° 32′ 1, south corner of station-master's house, 35° 11′ 6, top of nearest telegraph-pole, numbered 527, 119° 03′ 6, corner post of railway yard, 262° 59′ 4, near gable corner of hotel, 293° 02′ 4

Mackay, Queensland, 1923—Exact reoccupation of C I W station of 1913, in small triangular showground reserve between Albert and Alfred streets, west of Milton Street, 256 feet (78 0 meters) from southeast corner of reserve, and 134 5 feet (41 00 meters) from south fence of reserve, marked by hardwood peg True bearings center of second veranda-post from right on house, 800 feet (244 meters), 11° 18′ 8, gable of city brewery, 800 feet (244 meters), 64° 38′ 3, near corner of shed in north end of reserve, 206° 39′ 2, top of wind-vane on Apostle Church, one-fourth mile (0 4 km), 256° 16′ 2, center of tower on school, about one-fourth mile (0 4 km), 278° 14′ 9

Marree, South Australia, 1922—Close reoccupation of C I W station of 1911 and 1914, on open ground, on south side of railway, about 180 feet (55 meters) southeast of fence surrounding block containing Great Northern Hotel, about 300 feet (91 meters) southwest of fence bounding railway property, and 200 feet (61 meters) east of nearest corner of Wilson's butcher shop; marked by aluminum peg flush with ground True bearings gable ornament on Wilson's butcher shop, 73° 51′ 0, near corner of Great Northern Hotel, 157° 56′ 7, center top of semaphore, 450 feet (137 meters), 213° 05′ 2, near gable of railway running shed, 500 feet (152 meters), 246° 14′ 3, top of distant semaphore, one-fourth mile (0 4 km), 292° 25′ 8

Melbourne, Victoria, 1922—Incident to the removal of the observatory from Melbourne to Toolangi, on account of disturbances from electric cars at the former location, simultaneous observations were made at both places All three elements were observed on the earth-inductor pier in the absolute house at Melbourne Observatory The fixed mark is a brass tag on the wall of the main office building, 120 feet (36 6 meters), and its bearing is 273° 11′ 4

Menindie, New South Wales, 1923—Close reoccupation of C I W station of 1913, on north bank of Darling River, in large recreation reserve bounded by Pruella and Holding streets, 80 5 feet (24 54 meters) east of gate-post at west corner of reservation, 58 feet (17 7 meters) southeast of fence along Holding Street, 104 5 feet (31 85 meters) southwest of west corner of target stand, and 219 7 feet (66 96 meters) north of survey post inscribed "Park" near river, marked by hardwood peg True bearings near corner of chimney of Crown Hotel, 104° 57′ 4, spike on rear end of roof of town hall, 165° 18′ 4, west gable of vestibule of Roman Catholic church, one-fourth mile (0 4 km), 170° 33′ 6; left edge of chimney of house at east end of park, one-half mile (0 8 km), 227° 34′ 4

Mile-Post 632, Western Australia, 1923—On level desert south of Transcontinental Railway line, 179 5 feet (54 71 meters) south of first iron telegraph-pole east of water-tank and ninth east of mile-post 632, 416 5 feet (127 0 meters) east of east side and in line with north side of railway house No 49, marked by hardwood peg True bearings near gable of railway house No 49, 82° 35′ 5, center of iron telegraph-pole to left of west railway semaphore, one-half mile (0 8 km), 87° 09′ 0, top of ninth iron telegraph-pole east of mile-post 632, 173° 39′ 5, center of first iron telegraph-pole to right of east railway semaphore, one-half mile (0 8 km), 259° 55′ 5

Mount Lofty, South Australia, 1923—Intercomparison observations were made at two stations near Flinders Tower on summit of Mount Lofty Station *A* is 141 5 feet (43 13 meters) north-northeast of north-east corner of underground concrete water-tank, 132 8 feet (40 48 meters) southeast of base of Flinders

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AUSTRALIA—*continued*

Mount Lofty, South Australia, 1923—continued
Tower, measured from a point directly under door, and 79 5 feet (24.23 meters) southeast of southwest corner of summer house, temporarily marked by aluminum peg driven flush with ground, to be replaced by stone pier True bearings right edge of door of house in valley, 3 miles (5 km), 97° 33′ 2, upper left outside corner of tower door, 123° 21′ 9, right gable of stone building, in line with station *B*, 3 miles (5 km), 250° 30′ 9

Station *B* is 55 1 feet (16 79 meters) east-northeast from station *A*, and 108 6 feet (33 10 meters) southeast of southwest corner of summer house, marked by aluminum peg driven flush with ground, to be replaced by stone pier True bearings upper left outside corner of tower door, 150 feet (46 meters), 108° 02′ 6, right gable of stone building, 3 miles (5 km), 250° 30′ 9

Narrogin, Western Australia, 1921—Exact reoccupation of C I W station of 1912, about one-half mile (0 8 km) northwest of railway station, near southeast corner of general sports and agricultural show-grounds, 77.5 feet (23 62 meters) west of east fence, and 16 2 feet (4 94 meters) east-northeast of end pine in row of pine trees, marked by jarrah peg driven 3 inches (8 cm) below surface True bearings cross on Roman Catholic church, one-half mile (0 8 km), 0° 26′ 1, tip of spire on judges' box, 300 yards (274 meters), 97° 56′ 7, survey post in southeast corner of ground, 239 feet (72 8 meters), 342° 39′ 0

Narromine, New South Wales, 1923—About one-half mile (0 8 km) south of railway station, near north-east corner of sports grounds, 68 feet (20 7 meters) northwest of government survey peg near wagon gate, 43 5 feet (13 26 meters) east of double-trunk tree, and 64 5 feet (19 66 meters) southeast of north-east corner fence-post, marked by peg True bearings near corner of chimney of house, one-quarter mile (0 4 km), 67° 20′ 8, east gable spike on Gillispie mill, one-half mile (0 8 km), 181° 12′ 6, near gable of brown house to left of cemetery, one-fourth mile (0 4 km), 322° 46′ 0

Normanton, Queensland, 1923—Exact reoccupation of C I W station of 1912, on spur of rise about three-fourths mile (1 2 km) southeast of town and about 1 mile (1 6 km) south of wharf at foot of Lansborough Street, marked by jarrah peg projecting slightly above ground True bearings cross on left end of Catholic church, three-fourths mile (1 2 km), 75° 38′ 4, center of Divisional Board's Hall, three-fourths mile (1.2 km), 127° 06′ 6, near corner of small stone building at hospital, one-third mile (0 5 km), 348° 19′ 4 Inclination was also measured at a secondary station 97 paces south

Northam, Western Australia, 1921—Close reoccupation of C I W station of 1912, in public park and gardens reserve now used as golf links, about midway between River Avon and Clarke Street, and in line with fence on southwest side of east sanitary plot, about 395 yards (361 meters) southeast of survey post at Clarke Street corner, at which line to station makes an angle with side of Clarke Street of 39°, 195 8 feet (59 68 meters) from edge of large gum tree to north, and 149 0 feet (45 42 meters) from edge of large gum tree to southeast, marked by round stake True bearings center of Morrell's tomb, 2 miles (3 km), 259° 30′ 3, lower fork of large gum tree, 309° 28′, chimney-stack, three-fourths mile (1 km), 314° 43′ 4, top of gable of church, three-fourths mile (1 km), 332° 56′ 3

AUSTRALASIA

AUSTRALIA—*continued*

Oodnadatta, South Australia, 1923—Exact reoccupation of C I W station of 1911 and 1912, west of police station, which is about one-fourth mile (0 4 km) west of railway station, and west-northwest of school, and 265 5 feet (80 93 meters) west of nearest corner of police stable, marked by an earthenware pipe 36 inches (91 cm) long and 4 inches (10 cm) in diameter, filled with cement and lettered "C I W 1923," left just level with surface of ground True bearings near gable of metal house in Afghan Town, one-fourth mile (0 4 km), 41° 41′ 5, trigonometric station on hill, 3 miles (5 km), 183° 35′ 6, near gable of railway car-sheds, 249° 12′ 0, near corner of police stable, 262° 17′ 0, near gable of police station, 283° 15′ 5, top of south railway semaphore, one-half mile (0 8 km), 312° 44′ 6

Ooldea, South Australia, 1923—Proximate reoccupation of C I W station Ooldea Bore of 1914 On south side of transcontinental railway, in range with and 77 feet (23 5 meters) west of north side of station-master's house, 56 feet (17 1 meters) east of east tennis-court fence, and 62 6 feet (19 08 meters) south-west of southwest corner of hall, marked by tent-peg True bearings west railway semaphore, 86° 02′ 0, center of iron telegraph-pole in range with lamp-post, 200 feet (61 meters), 152° 47′ 6, north side of station-master's house, 256° 53′ 6, near edge of northwest sheep-chute south of side track, 321° 54′ 4

Peterborough, South Australia, 1923—Close reoccupation of C I W station Petersburg of 1911 In park reserve, at north end of Jervois Street, about one-half mile (0 8 km) north of town hall, 275 feet (83 8 meters) from road fence to south, 284 feet (86 6 meters) northwest of westernmost pillar of park gates, 54 0 feet (16 46 meters) from base of small fir tree to south, 57 9 feet (17 65 meters) northwest of corner post of row of posts surrounding football ground, and 40 0 feet (12 19 meters) west of sixth post (notched) from corner post, marked by jarrah peg 4 by 2 inches (10 by 5 cm), sunk flush with ground True bearings north edge of chimney of house, one-half mile (0 8 km), 256° 27′ 6, ornament on gable of house, 900 feet (274 meters), 296° 12′ 9, east side of railway semaphore, one-half mile (0.8 km), 322° 20′ 6, near edge of west gate pillar, 328° 07′ 0

Petersburg, South Australia, 1923—See Peterborough

Pine Creek, Northern Territory, 1923—Close reoccupation of C I W station Pine Creek of 1912 and Pine Creek *A* of 1914 On ant-bed flat on township-reserve southeast of police station, 171 feet (52 1 meters) and 263 feet (80 2 meters) respectively from south and east corners of fence around police station, marked by wooden peg True bearings center of ornament on east end of police shed, 150° 21′ 8, right edge of railway water-tank, 267° 57′ 8, north corner of hotel, 284° 26′ 6

Point Charles Lighthouse, Northern Territory, 1923—Close reoccupation of C I W station of 1914 Within lighthouse reserve, about one-fourth mile (0 4 km) east of lighthouse inclosure, and about 160 feet (49 meters) south of edge of cliff, 94 feet (28 7 meters) southwest of survey peg "R 44" at northeast corner of reserve, and 202 5 feet (61 72 meters) southeast of northwest corner of plantation fence True bearings left edge of chimney on cottage, 93° 06′ 8; right bottom edge of lower white section of lighthouse, 97° 16′

AUSTRALASIA

AUSTRALIA—*continued*

Port Augusta, South Australia, 1923—Two stations were occupied during intercomparison of instruments Station *A* is a very close reoccupation of station of 1914, on small sand hill on highest part of park lands, east of transcontinental railway cut, south of track to cricket-ground, and west of cricket-ground, marked by 6-inch (15-cm) earthenware pipe filled with concrete with an aluminum peg embedded at center, and lettered "C I W 1923 A" True bearings top of railway water-tank, 1,400 feet, (0 4 km) 27° 37′ 5, base of spire on town hall, one-half mile (0 8 km), 108° 01′ 8, base of brewery spire with weather-vane, 111° 46′ 0, center of gable of cathedral, 162° 03′ 8, east edge of roof of Pastoral Hotel, 349° 44′ 5

Station *B* is 46 3 feet (14 11 meters) west of station *A* on line to base of spire on town hall, marked by a wooden peg

Port Hedland, Western Australia, 1921—In sports ground, a large fenced inclosure on south side of main road running east, one-half mile (0 8 km) east of railway station, 35 62 feet (10 858 meters) east of southeast corner and in line with south edge of cement cricket-pitch, marked by jarrah stake 2 5 by 3 5 by 24 inches (6 by 9 by 61 cm), driven 3 inches (8 cm) below surface of ground True bearings bottom of signal-staff on light-tower, one-third mile (0 5 km), 54° 41′ 2, south edge of cricket-pitch, 80° 15′, cross on church, one-fourth mile (0 4 km), 82° 35′ 3, east gable of Ang-Qua store, 600 feet (183 meters), 144° 14′ 4, left edge of engine-shed, 1 mile (1 6 km), 271° 52′ 4

Port Lincoln, South Australia, 1923—Station of 1911 was closely reoccupied, in small park south of football oval, northwest of school grounds, 133 feet (40 5 meters), 144 feet (43 9 meters), and 156 feet (47 6 meters) respectively from fences to northeast, southeast, and southwest of park, west of path passing east of football oval, 17 feet (5 2 meters) west of large bush east of path, and 33 feet (10 1 meters) northeast of north corner of tennis-court in south corner of park, marked by peg True bearings ornament on east gable of house west of football oval, 134° 13′ 6, center of bottom of stone ornament on front of Methodist church, 277° 06′ 2, Flinders Monument on distant hill, 309° 31′ 4

Port Victor, South Australia, 1924—Exact reoccupation of C I W station of 1911 and 1914 On hill about 2 miles (3 2 km) northwest of town in southeastern part of reserve known as Glassonbury's Quarry, 103 5 feet (31 55 meters) from south fence, and 136 5 feet (41 61 meters) from fence on east bordering main road, marked by an aluminum pin three-fourths inch (1 9 cm) in diameter and 10 inches (25 cm) long driven through center of jarrah peg and covered with pile of stones True bearings west corner of small white house on hill, 2 miles (3 2 km), 187° 00′ 9, highest chimney of old tower, 2 miles (3 2 km), 262° 23′ 4, flagpole on square church-tower, 2 miles (3 2 km), 285° 03′ 3, foot of flagpole on Granite Island, 2 miles (3 2 km), 295° 44′ 9, rear gable of church, 1 mile (1 6 km), 320° 11′ 0, notice board on Rosetta Head, 3 miles (4 8 km), 349° 55′ 6

Red Hill, New South Wales, 1921—The two stations previously used in 1906, 1913, 1915, and 1916 were exactly reoccupied at Red Hill branch of Sydney Observatory at Pennant Hill Station *A* is on the stone pier formerly within magnetic hut, before hut was badly damaged by a falling tree True bearing white dial on sandstone pier, 200 feet (61 meters), 250° 49′ 4

AUSTRALASIA

AUSTRALIA—*continued*

Red Hill, New South Wales, 1921—continued

Station *B* is on grounds of observatory, 93 feet (28 3 meters) northeast of stone pier, marked by wooden stake 2 by 4 by 10 inches (5 by 10 by 25 cm) driven flush with ground True bearing top right edge of stone pier at station *A*, 26° 12′ 8

Richmond, Queensland, 1923—Close reoccupation of C I W station of 1913, in or near old water reserve on Flinders River, 158 feet (48 2 meters) and 166 feet (50.60 meters) respectively from west and south corner support posts of Mr W H Smith's cottage, marked by wooden peg driven flush with ground True bearings near corner of ventilator over postmaster's house, one-half mile (0 8 km), 0° 12′ 7, right edge of ventilator over court-house, 1° 44′ 2, survey peg at north corner section XXXV, one-fourth mile (0 4 km), 63° 25′ 5, near gable of Mr O'Keefe's new cottage, 149° 27′ 2, center of ornament on Mr W H Smith's cottage, 238° 58′ 5, left ventilator over Federal Palace Hotel, two-thirds mile (1 0 km), 358° 37′ 7

Rockhampton, Queensland, 1922—Close reoccupation of C I W station of 1913 and 1914, in recreation reserve between railway and Lion Creek Road, 396 5 feet (120 85 meters) from post of railway fence at north corner of reserve at Exhibition and Lion Creek roads, 160 5 feet (48 92 meters) from northeast boundary fence, and 42 feet (12 8 meters) and 44 5 feet (13 56 meters) respectively northeast of sixteenth and seventeenth posts of railway right-of-way fence, counted from north reserve corner, marked by tent-peg driven flush with ground True bearings top of ventilator on jail, one-fourth mile (0 4 km), 13° 58′ 4, center of turret on top of house on hill seen over high railway embankment, 1 mile (1 6 km), 36° 48′ 5, center of bottom of ornament on new stable near gable, 500 feet (152 meters), 90° 44′ 3, right edge of red railway post at north corner of reserve, 396 feet (120 7 meters), 153° 29′ 4, bottom of flagstaff on roof of pavilion, 205° 36′ 5, east corner railway post of reserve, 300° 38′ 1, top of railway signal-pole, one-fourth mile (0 4 km), 322° 46′ 4

Roma, Queensland, 1922—Exact reoccupation of C I W station of 1913, in recreation reserve, 166 5 feet (50 75 meters) north of corner of reserve at northwest end of Queen Street, and 23 5 feet (7 16 meters) from gum tree which bears approximately 23° west of south, marked by hardwood peg driven flush with ground True bearings center ornament on roof of hospital shed, 0 4 mile (0 6 km), 44° 00′ 5, near gable of yellow house near corner of reserve, 1,400 feet (427 meters), 239° 57′ 0, center of turret on courthouse, 0 4 mile (0 6 km), 330° 08′ 8, center of top cross on convent, 0 4 mile (0 6 km), 356° 46′ 5

Sorell, Tasmania, 1923—Close reoccupation of C I W station of 1913, on hill north side of main Sorell-Bellerive road, 0 3 mile (0 48 km) east of eleventh milestone from Bellerive, about 400 feet (122 meters) northwest through scrub up hill from old fence gate, nearly opposite gate across by-road leading to Lewis's, 107 feet (32 6 meters) northeast of hollow burnt tree of 8 7 feet (2 65 meters) girth taken 1 foot (0 3 meter) above ground, and 56 6 feet (17 25 meters) northeast of gum tree of 6 feet (1 8 meters) girth, marked by tent-peg True bearings trigonometric station on Mount Rumney, 5 6 miles (9 0 km), 43° 46′ 5, near gable of buildings, 5 miles (8 km), 54° 35′ 4, right edge of lone large tree near top of hill, 300 feet (91 meters), 135° 11′ 5, center of left gate-post having brace, 262° 43′ 5

AUSTRALASIA

AUSTRALIA—*continued*

Southern Cross, Western Australia, 1921—Exact reoccupation of C I W station of 1912, in large recreation ground north of railroad and in line with east fence of old small Wesleyan cemetery within Reserve No 8904, Block No 554, 100 feet (30 5 meters) north of northeast corner of cemetery, marked by jarrah peg sunk just below ground True bearings left edge of water-tank on hill, 1 5 miles (2 4 km) 59° 46′ 4, top of belfry of Church of England, three-fourths mile (1 km), 79° 52′ 3, center of front of Commercial Hotel, one-half mile (0 8 km), 91° 06′ 0

Southport, A Tasmania, 1923—On small flat on ridge behind Southport Hotel, 44 2 feet (13 47 meters) southwest of C I W station of 1914, 10 2 feet (3 11 meters) southwest of nearest point of fence, and 19 feet (5 8 meters) northwest of west end of hawthorn hedge, marked by peg True bearings edge of ledge on extreme right point of land, 5 miles (8 km), 323° 17′ 8, north corner of near roof of hotel, 300 feet (91 meters), 327° 31′ 0, right gable of kelp shed on small island, 3 miles (5 km), 345° 10′ 8, center of spar beacon, 2½ miles (4 km), 355° 32′ 3

Tambo, Queensland, 1922—Exact reoccupation of C I W station of 1913, in southwest corner of dam reserve, at corner of Arthur and Barcoo streets, 169 feet (51 5 meters) from southwest corner post of reserve, and 78 5 feet (23 92 meters) from fence bounding south side of reserve, marked by hardwood peg True bearings spike on near end of roof of house, 12° 36′ 2, southwest corner post of dam reserve, 46° 35′ 2, center of bottom of veranda-post in front of door at rear of house, 75° 53′ 9, northeast corner of dam reserve, 197° 53′ 1, southeast corner of dam reserve, 500 feet (152 meters), 261° 08′ 7, near gable of near building at Tambo station, 1.5 miles (2 km), 283° 26′ 1

Tarcoola, South Australia, 1923—Proximate reoccupation of C I W station of 1914, near center of railway reserve north of transcontinental railway, 152 paces northwest of northwest corner of railway station, in line with west end of bake-shop south of railway, 162 paces southwest of southeast veranda-post of Wilglen Hotel, and 44 feet (13 4 meters) east of lone leaning tree, marked by peg True bearings center of top of first railway signal-pole west of depot, 56° 02′ 5, northeast corner of schoolhouse, one-fourth mile (0 4 km), 120° 41′ 7, southeast corner, near roof, of Wilglen Hotel, in range with iron telegraph-pole, 223° 11′ 3, near corner of annex to Wilglen Hotel, in range with southeast hotel veranda-post, 224° 03′ 4, northwest corner of railway bake-shop, 353° 45′ 0

Tenterfield, New South Wales, 1922—Exact reoccupation of C I W station of 1913, near southeast corner of Douglas and Bulwer streets, in Tenterfield Golf Park, 320 feet (97 5 meters) from northwest corner fence-post, and 98 feet (29 9 meters) from west fence, marked by hardwood peg projecting above ground True bearings left edge of chimney on cottage, one-fourth mile (0 4 km), 37° 04′ 2, ornament on turret of Mr Ried's house, one-fourth mile (0 4 km), 145° 41′ 0, northwest corner post of park, 171° 50′ 5

Thursday Island, B, Queensland, 1923—Close reoccupation of station of 1912 In golf recreation reserve north of Summer Street, and east of road leading to slaughter-yards, near south end and within oval cycle-track, 131 6 feet (40 11 meters) and 151 2 feet (46 09 meters) from two trees within the cycle track to south and southeast, respectively, marked by wooden peg True bearings bottom of flagstaff visible over Metropole Hotel, one-half mile (0 8 km), 25° 48′ 8, bottom of right edge of flagstaff at white school, one-fourth mile (0 4 km), 44° 40′ 9, top of ventilator on house near aboriginal school, 500 feet (152 meters), 299° 13′ 2

Toolangi, Victoria, 1922—Simultaneous observations were made at Melbourne Observatory, and at Toolangi, the site to which the observatory was to be removed Station *A* is pier in north end of absolute house True bearing hole in a brass tag on a tree 260 feet (79 2 meters) distant, 205° 00′ 6 Station *B* is 14 1 feet (4 3 meters) north of *A* and is marked by a wooden post with a brass spike in top (to be replaced later by a more permanent marking), 91 3 feet and 85 2 feet (27 84 meters and 25 97 meters) respectively from southeast and southwest corners of variation building Same fixed mark is used as at *A*, and its bearing is 205° 00′ 6 Station *I* is the inclination pier in absolute house

Townsville, Queensland, 1923—Close reoccupation of C I W station of 1912, 1913, on land reserved for defense purposes, on old golf-links west of Isley Street, north of its intersection with Eyre Street, 345 5 feet (105 31 meters) north of fence-post at south corner of intersection, 290 feet (88 4 meters) north-northwest of fence-post at east corner of intersection, and about 350 feet (107 meters) southeast of southeast corner of shed on old golf-links, marked by local survey peg with numbers 3/4 cut on sides and left flush with ground True bearings right ventilator over bishop's palace, 48° 37′ 7, bottom of right flagstaff over fort, 230° 18′ 0, top of ventilator over school, 1¾ miles (2 8 km), 324° 57′ 3, center of water-pipe on house, 1¾ miles (2 8 km), 334° 38′ 7, center of trunk of tree on Castle Hill, 1¼ miles (2 0 km), 356° 32′ 5

Wagga Wagga, New South Wales, 1922—In common on north side of Murrumbidgee River, about one-fourth mile (0 4 km) east of bridge over river, 158 feet (48 2 meters) south of second telegraph-pole from near end of bridge, and 75 feet (22 9 meters) north of large gum tree in line with second telegraph-pole True bearings center of stand-pipe in front of Schrenberg store sign, about three-fourths mile (1 2 km), 26° 25′ 1, center of left post under bridge, about one-fourth mile (0 4 km), 76° 48′ 8, near gable of shed seen across small branch stream, about one-half mile (0 8 km), 241° 11′ 7, center of cross on near end of stone church on west side of street, about three-fourths mile (1 2 km), 342° 53′ 2

Watheroo Observatory, 1921-1926—The regular absolute observations for control of magnetograph records were made on piers N_w and N_m, and supplemental observations chiefly for comparisons of instruments were made at piers S_w and S_m Detailed descriptions of these positions will be found with the report of magnetograph records

Wellington, New South Wales, 1923—About 1 mile (1 6 km) west of post-office, within Wellington show-ground race-course, 204 paces southwest of fence-corner on road to Wellington, 145 6 feet (44 38 meters) east of ¼-mile post, which is in line with judge's stand, and center gable of grand-stand to west and tank on hill to east, marked by hardwood peg True bearings near gable of ground-keeper's house, 4° 49′ 6, center gable of grand-stand, 98° 59′ 1, center of spire on Catholic church, 1 mile (1 6 km),

AUSTRALASIA

AUSTRALIA—*concluded*

Wellington, New South Wales, 1923—continued 250° 53′ 9, left edge of large cement tank on hill, 1 mile (1 6 km), 278° 54′ 1

Werris Creek, New South Wales, 1922—Close reoccupation of C I W station of 1913, east of railway station, on north end of long hill, in open ground belonging to Messrs Doyle Brothers, 239 feet (72 8 meters) southeast of southeast corner of new school grounds, 6 feet (1 8 meters) northwest of lot survey peg numbered 18, 70 4 feet (21 5 meters) west of east fence-post in range with peg, and 92 5 feet (28 2 meters) east of post at northeast corner of paddock, marked by a New Zealand redwood tent-peg driven flush with ground True bearings ornament on east gable of new house, 500 feet (152 meters) 9° 51′ 6, near corner of Railway Cooperative Institute, one-fourth mile (0 4 km), 102° 56′ 0, east gable of schoolhouse, 400 feet (122 meters), 127° 27′ 6, fence post at northeast corner of school grounds, 500 feet (152 meters), 163° 24′ 4

Wilcannia, New South Wales, 1923—Exact reoccupation of C I W station of 1913, in Bourke Park, 73 feet (22 2 meters) west of Myers Street fence, and 165 feet (50 3 meters) northwest of post at corner of Myers and Hood streets, marked by hardwood stake 2 by 3 by 25 inches (5 by 8 by 63 cm) driven flush with ground True bearings right corner of race-course grand-stand, one-fourth mile (0 4 km), 83° 11′ 7, center of bottom of spike on Presbyterian church belfry, one-eighth mile (0 2 km), 283° 06′ 9, center of fence-post at corner of Myers and Hood streets, 288° 22′ 7, cross on near end of Anglican church, 270 feet (82 meters), 314° 36′ 5

Yalata Head Station, South Australia, 1923—Close reoccupation of C I W station of 1911, at Yalata Homestead, the head station of Fowler's Bay Sheep Station, about 7 miles (11 km) north of township of Yalata, at Fowler's Bay, at a point in line with eastern edge of station house and 289 5 feet (88 24 meters) from corner of garden wall on same line, marked by iron-bark peg True bearings left gable of wool-shed, 109° 47′ 2, right edge of station house, 161° 36′ 7, right edge of ruins, 221° 17′ 7

Yorketown, South Australia, 1924—Near southwest corner of Memorial Recreation Ground, 94 5 feet (28 80 meters) from notched post on inner west fence, and 92 8 feet (28 29 meters) from notched post on inner south fence These notched posts are 171 4 feet (52 24 meters) and 169 0 feet (51 51 meters) respectively from fence-post at southwest corner Marked by an inverted glass bottle set a little below surface True bearings ornament on nearest gable of red-roofed house, 900 feet (274 meters), 15° 24′ 6, cross on church-tower, 900 feet (274 meters), 120° 35′ 3, nearest gable of pavilion, 250 feet (76 meters), 189° 59′ 2, top corner of telephone-pole, three-fourths mile (1 2 km), 247° 18′ 2, windmill, 1 5 miles (2 4 km), 317° 45′ 4

NEW ZEALAND

Auckland, North Island, 1922—Close reoccupation of C I W station of 1906, near highest point of Domain, 99 3 feet (30 27 meters) north of center hole of Transit of Venus pier, and 98 2 feet (29 93 meters) from and parallel to its south edge, marked by hardwood peg, 3 by 2 by 20 inches (8 by 5 by 51 cm), driven flush with ground, and with arrow cut on its face True bearings trigonometric station on summit of Mount Eden 32° 45′ 1, finial on near church steeple on Kyber Pass Road, 77° 20′ 8, edge of south window in football shed, 1,000 feet (305 meters, 120° 47′ 9, flagstaff on church to right of Winter Garden building, 1 mile (1 6 km), 131° 30′ 2, trigonometric station on mountain across harbor, 5 miles (8 km), 221° 08′ 6

AUSTRALASIA

NEW ZEALAND—*Continued*

Christchurch, Jarrah Peg, South Island, 1922—Exact reoccupation of former C I W station, in grounds of Christchurch Magnetic Observatory, between office building and absolute house, 12 14 meters north of northeast corner of absolute house and 14 10 meters northeast of northwest corner, marked by jarrah peg sunk flush with ground, and containing brass tack at true center, surrounded by three jarrah tripod pegs

Clinton, South Island, 1922—In police paddock behind police station, 47 5 feet (14 48 meters) east of nearest point in west fence, 54 paces south of nearest point in north fence, 177 feet (53 95 meters) southwest of fence-post in line with flagpole on left end of railway station, and 40 feet (12.2 meters) north of south corner-post of paddock True bearings ornament on near end of cottage, about 300 feet (91 meters), 51° 45′ 2, ornament on west end of railway station, about 600 feet (183 meters), 209° 42′ 2, center of lone insulator on iron telephone-pole seen over stock-yards, about 500 feet (152 meters), 317° 23′ 9 The site of the New Zealand Magnetic Survey station and the C I W station of 1916 is probably within 60 feet

Cromwell, South Island, 1922—In sports-ground, about 500 yards (457 meters) north-northeast of New Zealand Magnetic Survey station, in line with the two north posts of east and west football-goals, 33 7 feet (10 27 meters) east of north post of east goal, 38 7 feet (11 80 meters) northeast of south post of east goal, and 164.3 feet (50 08 meters) south of last post in fence between sheds and small race-track, marked by small wooden peg driven flush with ground True bearings gable of barn seen on point near main street, about 1 5 miles (2 4 km), 17° 39′ 0, gable of cottage across corner roads from sports-ground, about 1,000 feet (305 meters), 80° 12′ 9, gable of largest shed in sports-ground, 250 feet (76 meters), 144° 08′ 7

Eketahuna, North Island, 1922—In Domain, about 75 feet (23 meters) northwest of west corner of north football-goal and about 75 feet (23 meters) northeast of last fence-post in fence in front of grand-stand, marked by small wooden peg driven flush with surface This is a practical reoccupation of the station of 1916

Kingston, South Island, 1922—On ledge of mountain, about 250 feet (76 meters) above level of Lake Wakatipu, 68 paces northwest of wire fence behind Lake Wakatipu Hotel, and about 50 paces southeast from high rock cliff True bearings left edge of near shed at jetty, about 300 feet (91 meters), 240° 01′ 9, right edge of lone house (Mr McLean's) in valley, about 2 miles (3 km), 314° 14′ 4 Station is a close reoccupation of New Zealand Magnetic Survey station of 1900 and about one-half mile (0 8 km) north of that of C I W 1916

Mount Victoria, North Island, 1922—Close reoccupation of C.I W station of 1916, on eastern side of ridge extending from Mount Victoria to Mount Albert, overlooking Lyall Bay, about one-half mile (0.8 km)

AUSTRALASIA

NEW ZEALAND—*concluded*

Mount Victoria, North Island, 1922—continued from Mount Albert, in a paddock east of road leading from Constable Street along top of ridge north to Mount Victoria, just north of first wicket gate True bearings flagstaff on Mount Victoria, 193° 51′ 4, cross of signal-mast, 300° 53′ 2 The magnetic observations made at this station in 1922 were seriously affected by proximity of electric cars

Queenstown, South Island, 1922—About 1 mile (1 6 km) east of town along the lake front, 45 feet (13 7 meters) north of center of Peninsula Street, 46 8 feet (14 26 meters) and 50 4 feet (15 36 meters) respectively from the nearest point and from southeast corner of fence about a pine plantation westward across Adelaide Street, and 60.5 feet (18 44 meters) southwest of fence-post standing at west edge of deep gully, marked by a brass tack in top of stake 2 inches (5 cm) in diameter True bearings near gable on Mr Vizzard's house, one-fourth mile (0 4 km), 93° 12′.2, near gable on far slaughter-house, one-fourth mile (0 4 km), 270° 54′ 9, near gable of house on point across lake, three-fourths mile (1 2 km) 307° 55′ 7 This is a close reoccupation of New Zealand Magnetic Survey station of 1900 and about 60 meters west of C I W station of 1916

Rotorua Gardens, North Island, 1922—In government gardens, about one-fourth mile (0 4 km) east of main bath buildings, 83 feet (25 3 meters) south-southeast of far side of road measured southward from road along a line touching easternmost extremity of rock crust around first blow-hole south of road from main bath building, 27 feet (8 2 meters) south of this extremity and 114 feet (34 8 meters) northwest of nearest edge of Lake Rotorua, marked by wooden peg flush with surface True bearings center of steeple on main bath building, 69° 58′ 9, ornament in front of chimney on near gable of white house to right of main bath building, 86° 55′ 3, right edge of lone flat red shed seen across lake, about 3 miles (5 km), 312° 43′ 8 Station of 1916 is in football-field east of military hospital

Roxburgh, South Island, 1922—Close reoccupation of New Zealand Magnetic Survey station, in Roxburgh domain, just north of sports-ground, 78 paces east of gate to north of sports-ground, 138 2 feet (42 12 meters) north of wire fence along north side of sports-ground, and 148 1 feet (45 14 meters) northwest of peak in stile over wire fence, marked by wooden peg 2 inches (5 cm) in diameter and 8 inches (20 cm) long, driven flush with ground True bearings center of right football goal-post at west end of field, about 250 feet (76 meters), 10° 33′ 7, near gable of cottage seen across road, about 300 feet (91 meters), 130° 57′ 8, left edge of near corner of chimney on Mr Bailey's house, about 1,000 feet (305 meters) 160° 11′ 9

EUROPE

BELGIUM

Uccle, 1922—Comparison observations were made with the standards of the Royal Observatory, at Uccle, near Brussels, using the piers upon which observations are made for control of magnetographs The declination station, designated *Park Station,* is a stone pillar in center of path leading southwest from absolute observatory, and about 65 meters distant from it *Pier NW* and *Pier W* are in the Absolute

EUROPE

BELGIUM—*concluded*

Uccle, 1922—continued observatory Inclination observations were also made on *Pier G,* which is the galvanometer pier of the observatory, 115 centimeters north of *Pier W*

DENMARK

Rude Skov, 1922—Intercomparison observations with Rude Skov Observatory (near Copenhagen) were made on piers regularly used for absolute observations to control the magnetograms Declination and horizontal intensity observations were made on *Pier DH* in small absolute house, and inclination observations were made on *Pier I* in large absolute house

FINLAND

Sodankyla, Finnish Lapland, 1922—Intercomparison observations were made at standard piers of Sodankyla Magnetic Observatory Declination and horizontal intensity were observed on *Pier S,* and inclination on *Pier W.*

FRANCE

Val Joyeux, 1922—Comparison observations with standards of the Val Joyeux Observatory (near Paris) were made on the pier regularly used for observations to control the magnetograph, a stone pillar in small hut about 40 meters west of main observatory building

GERMANY

Potsdam, 1922—Observations at the Potsdam Magnetic Observatory were made on the Trigonometric Pier, designated *TP,* this is a stone pillar in a wooden pavilion having open sides situated north of the absolute observatory

GREAT BRITAIN

Eskdalemuir, Scotland, 1922—Comparison observations with the standards of the Eskdalemuir Observatory were made as in 1915 in east and west magnetic huts Each hut contains three piers lying in a magnetic east-to-west line, numbered 1 to 6 from west to east, declinations and intensity observations were made on *Pier 2* in the west hut and on *Pier 5* in the east hut Inclination observations were made on *Pier 3* in the west hut

Greenwich Observatory, England, 1922—Comparison observations with the standards of the Royal Observatory at Greenwich were made for declination and inclination at the *Tent 1919* station, which is in inclosure around absolute magnetic observatory, 20 paces south-southeast of southeast corner of observatory, and as in 1915 and 1919, horizontal-intensity observations were made on center of *Intensity Pier* in absolute house

Kew Observatory, England, 1922—Comparison observations with the standards of Kew Observatory were made on the piers regularly used by the observatory for the control of magnetographs, which are the middle and west piers in the old absolute house, designated O_m, and O_w, respectively The middle and west piers of the new absolute house designated N_m, and N_w, respectively, were also used

Teddington, England, 1922—Horizontal intensity comparison observations with the Schuster-Smith magnetometer were made at the magnetometer house of the National Physical Laboratory The C I W

EUROPE

GREAT BRITAIN—*concluded*

Teddington, England, 1922—continued instrument was mounted on center of plaster-of-paris pier, 2 87 meters southeast of center of pier on which the Schuster-Smith instrument rests

GREECE

Kephisia, 1922—Close reoccupation of C I W station of 1911, east of Kephisia, at place called Kephalari, where National Observatory of Athens has made magnetic observations, about 200 meters south of water-works, east of new concrete reservoir, 13 7 meters N 30° W from most northerly of two small pine trees, and 12 1 meters east of wire-netting fence surrounding newly planted grove True bearings tip on church belfry, 20° 00′ 2, north finial on pavilion in front of hotel, 92° 01′ 8, base of weather-vane on brown stone house, 119° 01′ 7, west edge of factory tower, 157° 59′ 7, notch in mountain, 359° 20′ 8

HOLLAND

De Bilt, 1922—Comparison observations with the standards of the De Bilt Magnetic Observatory (near Utrecht) were made on the regular observing piers of the observatory, designated *Pier 4* and *Pier 8*

ITALY

Terracina, 1922—Comparison observations with the field instruments of the Italian Magnetic Survey were made at two stations on foreshore, about 1 mile (1 6 km) west of harbor, and about 500 meters west of site of 1913 comparisons Station *A* is about 112 meters from high-water mark and about 77 meters west of stone building with thatched roof, used for storing rifle-practice equipment True bearing landward edge of tower on headland, 15 kilometers, 61° 44′ 3 Station *B* is about 112 meters from high-water mark and 27 meters east of station *A* True bearing landward edge of tower on headland, 15 kilometers, 61° 47′ 6

PORTUGAL

Coimbra, 1922—Three stations were occupied Stations *A* and *C* are the observing piers in the absolute house of the Coimbra Observatory, *C* being 3 15 meters due south of *A* Station *B* is a stone pier outside absolute house, in line with stations *A* and *C* and 4 85 meters from station *C*, surrounded by a stone wall about one-half meter thick and 1 meter high

SPAIN

San Fernando, 1922—Intercomparison observations were made on piers of magnetic observatory at San Fernando, near Cadiz, and at a secondary station, designated *S*, about 2 meters from south wall of building and almost in line with *Pier N* and a cross painted on a wall about 500 meters distant Declination and horizontal intensity observations were made on *Pier N*, about 2 meters from north wall of observatory, and inclination observations on *Pier NE*, about 2 meters from northeast wall

Tortosa, 1922—Intercomparison observations were made at Ebro Observatory, situated on an elevation on western outskirts of village of Roquetas, about 2 kilometers northwest of town of Tortosa Declination and horizontal intensity observations were made on *Pier M*, and inclination observations on *Pier E*

EUROPE

TURKEY

Rumeli Hissar, Constantinople, 1922—Exact reoccupation of station of 1911, on heights above Rumeli Hissar, near Armenian cemetery and west of Robert College, on small bluff at west edge of meadow land, 21 5 meters east of northeast corner of most southeasterly group of five white marble tombs inside cemetery, 17 3 meters southeast of center of cross on marble slab over grave, and 17 5 meters south of center of cross on marble slab over grave, marked by drill-hole in top of marble column 19 centimeters in diameter and 57 centimeters long, set flush with ground True bearings lone tower on Mashlak Road, 96° 26′ 5, east edge of tower on khedive's palace, 230° 02′ 5

NORTH AMERICA

CANADA

Albert Harbor, Baffin Island, 1922—In valley with high cliffs on either side, facing ocean, southwest of Albert Island, and east-northeast of Hudson's Bay Company's post at Ponds Inlet, marked by low cairn True bearings cross on grave of F Borkenhauser, the taller and southernmost of two grave crosses, side by side, 96° 27′ 4, beacon on high knob just above station, 154° 09′ 4, beacon on highest peak of Albert Island, 240° 46′ 5

A secondary station, *B*, to test for local disturbance, was occupied, 200 paces west of main station

Amadjuak, Baffin Island, 1922—At Hudson's Bay Company's post, 208 feet (63 4 meters) true north 16° 8 east of left-hand corner (as observer faces it) of powder-magazine, indicated by a stone cairn in true azimuth 113° 8 True bearing boulder edge on left of cleft in rock ridge, 177° 47′ 7

Ashe Inlet, A, Baffin Island, 1921—Exact reoccupation of C I W station *A* of 1914 On big island near north shore of Hudson Strait, on east side of inlet, about 23 meters west and 5 meters north of ruins of frame house, about 40 meters north of shore-line, and 35 feet (10 7 meters) above high water, marked by drill-hole 2 centimeters in diameter in rock True bearings Tyrrel's beacon, 85° 25′ 6, beacon on east side of harbor entrance, 309° 47′ 6; beacon on Rabbit Island, 337° 33′ 7

Baffin Island No 1, Baffin Island, 1921—About 15 miles (24 km) east along coast from Bowdoin Harbor Observatory, and about 1 mile (1.6 km) inland

Baffin Island No 2 (Shatoito), Baffin Island, 1921—On coast, about 20 miles (32 km) west of the Hudson's Bay Company's post at Cape Dorset

Baffin Island No 3 (Noovookuok), Baffin Island, 1922—On south shore of northernmost cape of Fox Land, about 6 miles (10 km) east of point of Cape Dorchester

Baffin Island No 4, Baffin Island, 1922—On coast, about 30 miles (48 km) south of station Baffin Island No 3

Baffin Island No 5, Baffin Island, 1922—No description

Baffin Island No 6, Baffin Island, 1922—About 6 miles (10 km) north of bottom of bay south and east of Cape Dorchester

Baffin Island No 7 (Kiyetakyook), Baffin Island, 1922—On outside one of a number of small islands about 4 miles (6 km) from mainland

NORTH AMERICA

CANADA—*continued*

Baffin Island No 8 (Etenilk), Baffin Island, 1922—Near top of narrow point southeasterly of Hudson's Bay Company's post at Amadjuak True bearing Eskimo cairn, pole set in rocks, 2 miles (3 km), 240° 59′ 4

Baffin Island No 9 (Sabooyak), Baffin Island, 1922—On small island one-fourth mile (0 4 km) from mainland, about opposite west end of Big Island, and across harbor from shore running approximately east by south (magnetic), about one-half mile (0 8 km) distant, on rough rocky place about 25 feet (8 meters) from bottom of bay east of a narrow tickle True bearing west side of knob on rock ridge, 117° 59′ 4

Secondary station, Baffin Island No 9*A*, is on ice just off shore

Baffin Island No 10, Baffin Island, 1922—Along coast east of Hudson's Bay Company's post at Lake Harbor True bearing an Eskimo cairn, one-fourth mile (0 4 km) distant, 345° 10′

Baffin Island No 11—On low, narrow central portion of island about three-fourths mile (1 2 km) long and about 125 yards (114 meters) wide, lying about one-fourth mile (0 4 km) east of a larger island, and about one-third mile (0 5 km) west of island called Noodloo by Eskimos, which is about 1 mile (1 6 km) long, and lies about 2 miles (3.2 km) west of mainland, marked by stone cairn built a short distance magnetically south of station True bearing easterly edge at bottom of balanced boulder on ridge, 9° 04′ 4

Baffin Island No 12, 1922—About 25 miles (40 km) west of Resolution Island, in a small hollow below the highest point on eastern side of small islet measuring about 300 yards (274 meters) from north to south and about 400 yards (366 meters) from east to west, and lying about 1½ miles (2 4 km) south of mainland, about 50 yards (46 meters) from eastern shore of islet, 33 paces north of cairn on hill True bearings eastern end of islet, 207° 6, brow of low headland at west end of small island, 253° 09′, cape, 2 miles (3 2 km), 286°.6, cape, 9 miles (14 km), 289° 1, southern extremity of Resolution Island, 25 miles (40 km), 292° 6

Bowdoin Harbor, Baffin Island, 1921, 1922—At winter-quarters of the MacMillan Baffin Land Expedition, Bowdoin Harbor, in southeastern Baffin Island, approximately 50 miles (80 km) west of Hudson's Bay Company's post at Cape Dorset

The *magnetic and electric observatory* established by the Expedition was a temporary building built with stone walls covered with outside snow walls, with long axis of building in magnetic east and west, about 40 feet (12 meters) above mean sea-level, near shore, and directly south of schooner *Bowdoin,* which was frozen in the ice

The *absolute station* is 140 feet (42 7 meters) approximately true southwest of west corner of stone wall of magnetic and electric observatory, marked by a cairn of rocks 20 5 feet (6 25 meters) from station in line towards cairn on hill True bearings cairn of stones with long slab of laminated rock set vertically in middle on round hill, three-fourths mile (1 2 km), 333° 13′ 0, cairn of rocks on ridge, one-fourth mile (0 4 km), 323° 42′ 9.

Station *B* is 140 feet (42 7 meters) about southeast of *absolute station* Station *C* is 357 feet (108.8 meters) north of station *B*, 321 feet (97 8 meters) northeast of *absolute station,* and 248 feet (75 6 meters) magnetic east of east outer stone wall of variation observatory building

Station *observatory site* is at point which was made the southwest corner of inner "beaver-board" observing-room of variation observatory building

Camp Clay, Ellesmere Island, 1924—At the starvation camp of Lady Franklin Bay Expedition of 1884, on northeast coast of Bedford Pim Island, about midway between point of Cape Sabine and Cocked Hat Island Station is south of boulder bearing Memorial Tablet of National Geographic Society, which is south of Cross Lake, and the walls of Greely Hut, on Cemetery Ridge just north of row of depressions where dead were buried, 8 paces west of a big boulder, marked by small rock cairn True bearing boulder on sky-line, 343° 20′ 4

Cape Dorset, Baffin Island, 1921, 1922—Station *A* occupied December 1921, near Hudson's Bay Company's post south of Parson's Harbor, 135 feet (41 2 meters) 10° magnetic west of north from nearest corner of main building, 107 feet (32 6 meters) 67° west of magnetic south from flagpole, and 32 feet (9 8 meters) 46° west of magnetic north from nearest corner of powder-house

Station *B*, occupied in August, 1922, is northeast of station *A*, 272 feet (82 9 meters) east of flagpole, and 147 feet (44 8 meters) north of powder-house, marked by tent-peg with cross in top covered with small cairn of rocks True bearings beacon on hill, 48° 46′ 2, beacon across harbor, 156° 00′ 5

Fox Channel Ice Station No 1, 1921—Observations made while tied up to ice floe

Lake Harbor, Baffin Island, 1922—Southwest of Hudson's Bay Company's post, on a level bit of sand on hillside, 6 feet (1 8 meters) from bottom of cairn on line from southwest corner of church produced northwestwardly through cairn This cairn is about 42 inches (1 1 meters) high on bed-rock 195 feet (59 4 meters) 105° west of magnetic south from southwest corner of westerly extension of post manager's house, and 273 feet (83 2 meters) 10° west of magnetic north from northwest corner of chancel of church Station is marked by pine stake left about 1 inch (2 5 cm) above ground

Two stations, *Secondary 1* and *Secondary 2,* were occupied to test for local disturbance The former is on ice about one-third mile (0 5 km) from main station, and the latter is about 300 yards (274 meters) from main station in opposite direction

Nauwatta, Baffin Island, 1922—About 50 miles (80 km) north of Bowdoin Harbor and about 10 miles (16 km) north of station Baffin Island No 4, on a peninsula extending 2 to 3 miles (3 to 5 km) westward, about three-fourths mile (1 2 km) east of seashore, and east of a narrow lake about three-fourths mile (1.2 km) long, there is a cairn of rocks some distance southwest of station

Ponds Inlet, Baffin Island, 1922—Station is about 1,300 feet (396 meters) west of Hudson's Bay Company's post, Ponds Inlet, and 27 paces from high-water mark True bearing flagpole on house of manager of post 211° 45′

A secondary station about 1,300 feet (396 meters) southwest of main station along beach was also occupied

Queen's Cape, Baffin Island, 1921—On west coast of Baffin Island, in Fox Channel, at first anchorage north

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CANADA—*concluded*

Queen's Cape, Baffin Island, 1921—continued of Bowdoin Harbor and second north of Cape Dorset, on rocky headland from which compass bearing of next point to north up coast is north 60° east and of next point to south down coast is south 40° west, at a point well above high-water mark and sloping stony beach, on flat shelf on south side of round flat plateau, ending in small rocky points and two ledges that are awash at high water and form islands at low water, making good anchorage, marked by small rock cairn True bearing rock cairn, one-half mile (0 8 km), 236° 03′ 3

Sydney, Nova Scotia, 1921, 1923—Close reoccupation of C I W station of 1914, which was a close reoccupation of the station of 1905, 1908, and 1909 On highest point in western portion of Victoria Park northwest of city and about 1 mile (1 6 km) south of iron foundries, within race-track about 85 paces northeast of stump of willow tree, about 109 paces south of wooden signal-tower, and about 12 feet (3 7 meters) east of line joining stump and tower True bearing spire on Sacred Heart Church, 305° 54′ 0

CENTRAL AMERICA

Acajutla, Salvador, 1926—Proximate reoccupation of C I W station of 1909, near center of well-defined promontory, about three-fourths mile (1.2 km) south of pier, 10 meters from edge of cliff at north side of promontory, and 8 meters and 6 meters from edge of cliff to westward and southward respectively, marked by peg True bearings extreme west end of shed on outer end of pier about three-fourths mile (1 2 km), 140° 17′ 1, tip of flagpole in front of steamship company's office, 167° 03′ 2, gable of wooden building about 500 meters, 243° 50′ 2

Amapala, Honduras, 1923—Practical reoccupation of C I W station of 1909 On hill south of road to cemetery branching from street to wharf, in barbed-wire inclosure covered with large rocks and gravel, belonging to Señor Enrique Streber, 40 3 feet (12 28 meters) north-northwest of northwest corner of lone tile-roofed house, 27 5 feet (8 38 meters) south of fence along road, 7 5 feet (2.29 meters) east of ditch leading to house, 60 5 feet (18 44 meters) southeast of a 5 by 4 foot (1 5 by 1 2 meters) rock projecting 3 feet (0 9 meter) above surface, and 8 feet (2 4 meters) southeast of a smaller rock, marked by a 1 by 2 inch (3 by 5 cm) stake driven flush with surface True bearings cupola on Rossner's store by harbor, 154° 38′ 4, cross on small church in town, 155° 29′ 2

Ancon Hill, Panama, 1926—On top of Ancon Hill near center of grass plot, west of loop at end of military road leading to hill-top, 32 5 feet (9 91 meters) southeast of concrete bench-mark of United States army on east edge of road, marked by drill-hole in top of concrete marker set slightly above surface True bearings center of black and white marker in canal, 52° 28′ 8, lighthouse across canal, 91° 12′ 8, southwest corner of hut, 307° 55′ 6

Belize, British Honduras, 1923—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1909, in southern part of town, on grounds of governor's house, 125 feet (38 1 meters) south of flagstaff in front of house, 26 5 feet (8 1 meters), 11 5 feet (3 5 meters), and 84 feet (25 6 meters) from palm trees to northeast, east, and south, respectively, and 17 feet (5.2 meters) from northwest corner of boat-house, marked by 3-inch

NORTH AMERICA

CENTRAL AMERICA—*continued*

Belize, British Honduras, 1923—continued (8-cm) wooden stake set flush with ground True bearings right edge of flagpole in front of governor's residence, 197° 34′ 8, spire on St Mary's Church, 204° 01′ 9, base of flagpole on United Fruit Company's building, 229° 35′ 8, light arm at Fort George, 236° 57′ 8

Station *B* is in extreme northern end of town, just outside of quarantine station and north of barracks, 30 feet (9 1 meters) west of gate to quarantine station, 15 feet (4 6 meters) north of curve in road, 75 feet (22 9 meters) northeast of wooden shelter at concrete target range, and 49 5 feet (15 09 meters) southeast of north end and 46 6 feet (14 20 meters) east of south end of culvert, marked by 3 by 2 inch (8 by 5 cm) peg driven flush with ground True bearings gable of wireless operator's house, 16° 18′ 3, spire on Wesleyan church, 353° 41′ 0

Bluefields, Nicaragua, 1923—In cemetery in southern end of town, about 14 feet (4.2 meters) north of northwest corner of hedge running along south boundary of cemetery, 34 3 feet (10 45 meters), 7.9 feet (2 41 meters), and 11 1 feet (3 38 meters), respectively, from monuments to southeast, south, and southwest, and 32 8 feet (10 00 meters) south of lone lime tree, marked by stake driven flush with surface, its center designated by brass tack True bearings spire of cathedral, 133° 31′ 0, northwest edge of first house to east, 214° 23′ 9

Bluefields Bluff, Nicaragua, 1923—Close reoccupation of C I W station of 1909 On east slope of hill on which is located home of collector of customs, 37 5 feet (11 43 meters) east of north edge of gate leading into grounds, 92 0 feet (28 0 meters) southeast of corner of stone wall at northeast corner of property, and 77 5 feet (23 62 meters) northeast of corner of fence at southeast corner of property, marked by stake driven flush with surface True bearing tip of lighthouse, 292° 13′ 7

Casuna, Honduras, 1923—Northwest of United Fruit Company's railroad-construction camp known as Casuna, about 100 yards (91 meters) northwest of main barracks, 75 0 feet (22 9 meters) northeast of path leading to sea, 88 feet (26 8 meters) southwest of wire fence, 70 5 feet (21 5 meters) southeast of edge of soil and beach, and 101 feet (30 8 meters) north of outhouse, marked by surveyor's peg 2 by 2 inches (5 by 5 cm), projecting 6 inches (15 cm) above surface True bearing gage-board on water-tank, 31° 53′ 6

Colon, Limon Point, Panama, 1926—On west shore of Limon Bay, about three-fourths mile (1 2 km) south of Limon Point on beach known as Camp No 6, 20 meters southwest of water-line, marked by stake 3 feet (0 9 meter) long projecting 6 inches (15 cm) above surface True bearings left smoke-stack of two, 225° 28′ 5, left wireless mast 227° 56′ 3, right wireless mast, 229° 01′ 1

Colon, Sweetwater, Panama, 1921, 1922—Practical reoccupation of station of 1915 and proximate reoccupation of station established in 1907 and closely reoccupied at later dates, across bay due west of Cristobal, on north side of Sweetwater Inlet, about 170 paces north along shore from foot-bridge, located with reference to a group of palms, three of which form an equilateral triangle about 20 feet (6 1 meters) on each side, 11 6 feet (3 54 meters) northeast of north tree nearest shore, and with reference to an 8-inch (20-cm) water-main, 78 2 feet (23 83

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CENTRAL AMERICA—*continued*

Colon, Sweetwater, Panama, 1921, 1922—continued meters) north 55° east from joint between pipes numbered 698 and 2170, which is thirty-first joint north of large valve near foot-bridge, and 69 5 feet (21 18 meters) east of seventh joint farther north, which is at south end of pipe numbered 4505, marked by a rough coral block set flush with surface (brass-bound tripod stakes driven flush were left in position) True bearings south end of bridge, 6° 20′, Galatea Point, 231° 02′ 9, left edge of Washington Hotel, 247° 54′ 0, top of left wireless tower, 251° 27′ 8, top of right wireless tower, 252° 18′ 7, pilot's signal tower behind pier 6, 261° 25′ 3

Colon, Washington Hotel, Panama, 1922—Close reoccupation of C I W station of 1915, 1916, on grounds east of Washington Hotel, in Bolivar Street near where it ends at sea-wall, and north-northwest of Christ Episcopal Church, 8 97 meters east of eastern wall of hotel grounds at fourth pillar, 20 7 meters southeast of pillar at junction of hotel wall and sea-wall, 23 9 meters southwest of pillar at end of sea-wall, and 31 4 meters northwest of lamp-post at nearest corner of church, marked by hardwood peg 2 inches (5 cm) square, with a brass stud in center True bearings light on east end of west breakwater, 145° 09′ 9, light on west end of east breakwater, 157° 18′ 2, east end of east breakwater, 203° 09′ 7, lamp-post at northwest corner of church, 323° 45′ 5

Copan, Honduras, 1926—About 400 feet (122 meters) east of center of Great Plaza at Maya ruins on top of mound No 3 according to plan published by Department of Mid-American Archeology, marked by a cut stone 8 by 8 by 18 inches (20 by 20 by 46 cm) buried so as to project about 4 inches (10 cm) above surface, with cross marking center True bearings rod held on mound No 16, 960 feet (293 meters) 11° 57′ 4, south spire of Copan church, 1 5 miles (2 4 km), 86° 11′ 7, north spire of Copan church, 1.5 miles (2 4 km), 86° 43′ 2, stela 10, 2 62 miles (4 21 km), 94° 13′ 9, stela 12, 1.37 miles (2 20 km), 290° 12′ 3

Corinto, Nicaragua, 1923—Practical reoccupation of C I W station of 1909 Across bay from town of Corinto, on beach, just south of sand-bar exposed at low tide, 60 paces southwest of base of high bluff upon which stands house of Señor Antonio Lopez, and 8 feet (2 4 meters) back of high-water mark, marked by 2-inch (5-cm) round stake set to within 4 inches (10 cm) of surface True bearings gable of U S consulate, 160° 31′ 8, cupola of church in Corinto, 173° 54′ 6, lightning-rod on Señor Lopez's house, 237° 03′ 7

Corozal, Panama, 1926—Two stations were occupied Station *A* is at top of small hill, northeast of barracks of Tenth Signal Company, about 150 meters southeast of army post headquarters building, marked by hole in cement marker 6 inches (15 cm) square on top extending slightly above surface True bearings triangulation station, 69° 29′ 6, triangulation station on mountain, 133° 18′ 6, left wireless tower at Balboa, 337° 31′ 8, right wireless tower at Balboa, 337° 54′ 4, naval signal-station on hill, 344° 45′ 8

Station *B* is northwest of station *A*, 33 2 meters northwest of lone tree at foot of small hill, 11 meters northeast of footpath from headquarters to Tenth Signal Company's barracks, marked as at *A* True bearings left edge of electric-light pole, 93° 07′ 8, tip of flagpole, 107° 30′ 4, gable of Tenth Signal Company barracks, 328° 17′ 4

NORTH AMERICA

CENTRAL AMERICA—*continued*

David, Panama, 1923—Two stations were occupied Station *A* is close reoccupation of C I W. station of 1907, in plot of ground owned by Señor Halfen, north of Iglesia del Carmen just west of town plaza, 31 6 feet (9 63 meters) from wire fence on north, 51 5 feet (15 70 meters) from fence on west, 101 7 feet (31 00 meters) from wall of sheds used formerly as moving-picture hall on east, 129 5 feet (39 47 meters) northwest of northeast corner of church, 61.5 feet (18 75 meters) northeast of northwest corner of church, and 66 7 feet (20 33 meters) north of west corner of side door of church, marked by stake with copper tack True bearings northwest corner of church, 60° 45′ 5, outside edge of porch post of hotel, 322° 12′ 6

Station *B* is over monument No 1 marking south end of meridian line established by U S Army Engineer Corps in southeast corner of plaza facing government building and bounded on northwest side by railroad, 73 2 feet (22.31 meters) northwest of south edge of house in southwest corner of block to east, and 81 2 feet (24 75 meters) northwest of corner of house in northwest corner of block diagonally opposite, monument is a 10-inch (25-cm) square concrete post with one-half-inch (1-cm) iron bolt in center, the whole projecting about 6 inches (15 cm) above surface True bearings southwest edge of house, 123° 00′ 2, vertex of letter V in sign "David" on railroad station, 180° 48′ 4

El Cayo, British Honduras, 1923—Practical reoccupation of C I W station of 1909, east of village and about 150 yards (137 meters) west of river, on a small knoll at junction of two paths leading to river, and about 50 yards (46 meters) east of small clump of trees, marked by concrete block 6 inches (15 cm) square, projecting 4 inches (10 cm) above surface, and marked "C I W 1923" True bearing flagpole in district commissioner's yard, 4° 47′ 1

Flores, Guatemala, 1923—Close reoccupation of C I W station of 1909 on peninsula of Tayasal, on shore of Laguna Peten, west of trail to El Cayo, and opposite street on island of Flores leading down from church, in yard occupied by two native huts, 61 1 feet (18 62 meters) south of southwest corner of hut nearest trail, 30 feet (9 1 meters) east of eastmost palm tree, 45 feet (13 7 meters) north of lake shore, and 49 6 feet (14 12 meters) west of wire fence, marked by 3-inch (8-cm) peg driven to within 4 inches (10 cm) of surface True bearings west gable of barracks in Flores, 9° 38′ 0, west gable of house on west end of Flores Island, 18° 23′ 3, northwest corner of partly constructed hospital on island in lake, 321° 32′ 5

Granada, Nicaragua, 1923—Practical reoccupation of C I W station of 1909 In western part of town, north of Calle 5, and in property lying northwest of masonry viaduct over a deep ravine where road crosses into Calle 5, 36 5 feet (11 12 meters) southwest of southwest fence corner, 42 6 feet (12 98 meters) southeast of southeast corner of house, and 45 0 feet (13 7 meters) north of edge of ravine, marked by a 2-inch (5-cm) stake driven to within 4 inches (10 cm) of surface True bearings gable of roof of hospital, 85° 05′ 9, cross on San Francisco Church, 286° 08′ 1, spire on small cupola in front of Mercedes Church, 341° 19′ 5

Greytown, Nicaragua, 1923—Proximate reoccupation of C.I W station of 1909, which was inaccessible owing to floods In public plaza at west end of town, between Calle Real and St John's Masonic Cemetery, 160 0 feet (48 77 meters) north of gate of

NORTH AMERICA

CENTRAL AMERICA—*continued*

Greytown, Nicaragua, 1923—continued
cemetery, 140.0 feet (42.67 meters) south of south rail of abandoned tram-line along Calle Real, and 250.0 feet (76.20 meters) northeast of northeast corner of house by cemetery, marked by stake set flush with surface. True bearing: northwest corner of bodega by river, 236° 46′.9.

Guatemala, Guatemala, 1923, 1926—Two stations were occupied on ground used for public baths called "El Tuerto" at eastern extremity of Calle Oriente 10. (C.I.W. station 1909 was near north corner of grounds, but is unsuitable for reoccupation.) Station *A* is at the southwestern end of grounds, near west edge of west branch of road leading south past office, 21 feet (6.4 meters) south of junction with east branch, at point on extension of center line of Calle Oriente 11, 115 feet (35 meters) northeast of northeast corner of hut and northwest of deep arroyo, marked by concrete monument 8 by 8 by 24 inches (20 by 20 by 61 cm.) lettered "C.I.W. 1926 A" set so as to project about 3 inches (8 cm.). True bearings: south wireless tower (tower was moved in 1924), 58° 13′.7, north wireless tower, 59° 30′.3, cross on San Francisco Church, 91° 31′.7, San Domingo Church spire, 116° 00′.0, tip on sentry-box on southwest corner of Fort Matamoras, 225° 39′.9.

Station *B* is at extreme southeast corner of grounds, 108 paces east of station *A*, 125 feet (38 meters) north of bank of arroyo, at intersection of road running north to water-tank with road along arroyo, marked by concrete monument 8 by 8 by 24 inches (20 by 20 by 61 cm.) lettered "C.I.W. 1926 B." True bearings: south wireless tower, 58° 22′.8, north wireless tower, 59° 37′.6, San Domingo Church spire, 108° 52′.9, southwest sentry-box of Fort Matamoras, 223° 08′.0.

Itsimte, Guatemala, 1923—About 250 yards (229 meters) east of range of hills, and east of small field, on small cleared knoll, about 750 feet (229 meters) northwest of group of monuments in high bush at base of pyramid, 14 feet (4.3 meters) south of southwest corner and 22 feet (6.7 meters) southwest of southeast corner respectively of hut, and 5 feet (1.5 meters) northeast of limestone rock upon which a cross is cut to indicate station. True bearings: brass screw in lone ceybo tree, 100 feet (30.5 meters) high and 3 feet (0.9 meter) in diameter, 136 feet (41.5 meters), 249° 13′.2.

Ixlu, Guatemala, 1923—On plaza at northwest corner of pyramid, 17 feet (5.2 meters) north of group of three monuments lying in a row, marked by a 2-foot 0.6-meter) stump projecting 1 foot (0.3 meter) above surface. True bearing: cross blazed on tree, 91 feet (27.7 meters), 319° 25′.9. (No magnetic observations at this station.)

Managua, Nicaragua, 1923—Two stations were occupied. Station *A* is a close reoccupation of C.I.W. station of 1909. In eastern part of city, on triangular plot bounded by roads separating property of Napoleon Rey from that of Santos Remedios, 60.0 feet (18.29 meters) southeast of gable-roofed gate leading into Remedios property, near northwest apex of plot, 17.6 feet (5.36 meters) northeast of fence-line on Remedios property, and 80.5 feet (24.54 meters) southwest of apex of plot in direction of Napoleon Rey's house, and 75 feet (22.9 meters) from southeast apex, marked by stake 2 by 2 inches (5 by 5 cm.) set flush with surface. True bearings: flagpole on fort "La Loma," 55° 58′.1, stack of electric plant, 199° 01′.8, south gable of Napoleon Rey's house, 256° 37′.7.

Station *B* is in southern part of town, in large field lying between Campo de Marte occupied by the U. S. Marine Corps and base of high hill upon which is located Nicaraguan fort "La Loma," 477.5 feet (145.54 meters) south of sentry-box on west side of main entrance to Campo de Marte, 290 feet (88.4 meters) east of road leading to La Loma, and 550 feet (168 meters) north of base of hill, marked by 2-inch (5-cm.) stake driven flush with surface. True bearings: flagpole on fort on hill, 25° 48′.1, east wireless tower, 171° 43′.9, stack of electric plant, 233° 56′.5.

Nakum, Guatemala, 1923—At south base of pyramid known as "Pyramid U," about 20 feet (6.1 meters) southeast of very large monument standing on end. (No magnetic observations at this station.)

Naranjo, Guatemala, 1923—On southeast corner of pyramid about 50 feet (15 meters) high, just south of pyramid with hieroglyphic stairway. (No magnetic observations at this station.)

Oak Ridge, Honduras, 1923—Between road running between beach and shore of back inlet, just beyond sheds of old canning-plant and end of bulkhead, 47.0 feet (14.33 meters) southwest of west corner of shed, 55.4 feet (16.89 meters) southwest of south corner of shed, 12 feet (3.6 meters) southwest of edge of inlet, and 8 feet (2.4 meters) northwest of edge of road, marked by post driven to within 6 inches (15 cm.) of surface. True bearings: gable of Thompson residence across inlet, 105° 17′.4, west gable of McNab residence and store across inlet, 135° 00′.4.

Old Panama, Panama, 1921, 1923, 1924, 1926—Three stations were occupied. Station *A*, occupied in 1921, 1923, 1924, and 1926, is on site of ruins of old city of Panama, about 8 miles (14 km.) east of Ancon, 72.5 feet (22.1 meters) west of southern corner of ruined square cathedral tower, the most prominent ruins in old Panama, and in line with that face of tower which is toward sea, marked by a 10-inch (25-cm.) brass-bound tripod peg driven flush with ground. True bearings: extreme east end of Taboguilla Island, 6° 38′ (approx.), gable of house on Culebra Island, almost in line with coconut palm on beach which is 133.5 feet (40.69 meters) distant, 23° 46′.2, gable of restaurant and bar 69° 21′ (approx.), southwest corner of old cathedral tower, 258°.

Station *B*, occupied in 1923, is about 100 feet (30 meters) north of shore, and north of small gully, 129.6 feet (39.50 meters) southeast of station *A*, 53.1 feet (16.18 meters) south of nearest edge of old wall of cathedral nearest tower, and 70.0 feet (21.34 meters) northeast of east post of two near beach, about 14 inches (35 cm.) in diameter with 1-inch (2.5-cm.) iron bolt in center, marked by round rock 6 inches (15 cm.) in diameter, set flush with surface, its center being marked by a cross. True bearings: extreme left edge of Taboguilla Island, 6° 41′.8, gable of house on Culebra Island, 23° 57′.4, gable of restaurant and bar 85° 42′.8, telephone-pole by convent, 120° 03′.9, station *A*, 131° 45′.

Station *C*, occupied in 1924 and 1926, is 156.0 feet (47.55 meters) west of *A*, 54.0 feet (16.46 meters) east of paved automobile road, and 36 feet (11.0 meters) northwest of small wooden sentry-box;

NORTH AMERICA

CENTRAL AMERICA—*continued*

Old Panama, Panama, 1921, 1923, 1924, 1926—cont'd marked by wooden stake driven flush with ground True bearings extreme east point of Perico Island, 6° 27', gable of nearby restaurant and bar, 50° 08', northwest corner of old cathedral tower, 253° 7

Port Limon, Costa Rica, 1923—On hill north of main part of town just west of 15-foot (4 6-meter) cut made by continuation of street on which stands cathedral, about 300 yards (274 meters) northwest of two fuel-oil tanks of United Fruit Company, 250 feet (76 meters) northeast of northeast corner of house of a dairy farm, 175 0 feet (53 3 meters) east of large tree, 20 0 feet (6 10 meters) south and 38 0 feet (11 58 meters) north of lime trees, respectively, and 250 feet (76 meters) west of northwest corner of house across cut, marked by stake driven flush with surface True bearings east wireless tower, 273° 21' 3, west wireless tower, 275° 58' 1, tip of light on Uvita Island, 284° 03' 9, highest stack of power-house, 312° 19' 4

Prinzapolca, Nicaragua, 1923—Practical reoccupation of C I W station of 1909 At southern end of town on east bank of Prinzapolca River, in swampy pasture belonging to Mr James Harrison, just southeast of his house, 40 2 feet (12 25 meters) south of barbed-wire fence on north boundary, 80 5 feet (24 54 meters) east of wire fence on west boundary, and 250 feet (76 2 meters) northwest of lone tree, marked by stake driven flush with surface True bearings lower north edge of north stack of saw-mill, 19° 13' 2, tip of flagstaff of Eden Mining Company, 100° 41' 6, tip of staff of wharf building, 141° 55' 0, base of staff on comandancia, 194° 57' 3, west gable of house, 291° 42' 6

Puerto Barrios, Guatemala, 1923—Practical reoccupation of C I W station of 1909 On tract of low land east of harbor, about 250 yards (229 meters) north of United Fruit Company's commissary, 95 feet (29 0 meters) east of path leading to commissary, 27 feet (8.3 meters) west of vertex of acute angle made by two intersecting drainage ditches, and 132 5 feet (40 39 meters) northeast of near corner of concrete fountain on path to commissary, marked by peg driven flush with surface True bearings staff on comandancia, 78° 17' 2, base of flagpole by harbor, 95° 19' 3, right-hand edge of railroad concrete water-tank, 307° 35' 3

Puerto Cortez, Honduras, 1923—On property of Señor Lefebre northeast of hotel, on east edge of sandy fill, 62 7 feet (19 11 meters) northeast of plank crossing over ditch running east and west, 59 9 feet (18 26 meters) east of barbed-wire fence on west boundary of property, 60 9 feet (18 56 meters) southeast of southeast corner of negroes' quarters and 9 3 feet (2 84 meters) west of edge of fill, marked by stake set flush with surface True bearings south edge of south stack of power-house, 101° 19' 4, gable of lone house, 105° 55' 3

Quesaltenango, Guatemala, 1923—On government property in eastern part of city, southeast of sports and athletic field called El Hipodromo, in extension of line of street leading to city, 160 paces southeast of board fence around race-track, measured toward opening in barbed-wire fence on southeast side of property 69 paces distant, 23 7 feet (7 22 meters) east of bank of shallow gully measured along line toward cross on church, marked by square peg True bearings cross on large dome of cathedral, 77° 36' 9, tip of Central American Monument, 80° 52' 7, cross on church in northern section of city, 89° 44' 2

NORTH AMERICA

CENTRAL AMERICA—*continued*

San José, Costa Rica, 1923, 1926—Four stations were occupied Station *A*, occupied in 1926, is a close reoccupation of C I W station of 1907, about 700 feet (213 meters) west of railway, and about 450 feet (137 meters) south of church of San Francisco de Guadelupe, and about 400 feet (122 meters) south of car line

Station *B*, occupied in 1923 is on sloping ground just west of southwest corner of National Penitentiary, located on hill north of Torres River and overlooking town, 301 0 feet (91 74 meters) northwest of southwest sentry-box on wall, and 247 0 feet (75 29 meters) west, measured at right angles to fifteenth buttress of wall, counting from southwest sentry-box, marked by round stake True bearings gable of padre's house, 67° 16' 7, base of vane of National Theater, 337° 10' 0, stack of España Martinez y Compañia, 338° 25' 7, dome of cathedral, 342° 13' 8, flagstaff of telegraph building, 346° 40' 9

Station *C*, occupied in 1923, is about 200 yards (183 meters) north of station *B*, down slope of hill toward river, 133 5 feet (40 69 meters) northwest of northwest sentry-box on wall surrounding penitentiary, and 61 0 feet (18 59 meters) west of barbed-wire fence running north from sentry-box to river, marked by round stake projecting slightly above surface True bearings spire of La Mercedes church in San Jose, 17° 01' 0, spire of church in San Domingo, 166° 34' 8

Station *D*, occupied in 1926, is at southwest corner of grounds of golf club, 10 meters east of row of trees on west boundary and 10 meters north of row of trees on south boundary, marked by peg True bearings left edge of club-house, 186° 51' 3, right edge of telephone-pole, 228° 36' 9, left edge of hut, 276° 41' 8

Station *E*, occupied in 1926, is on grounds of golf club, 116 paces northeast of *D*, 5 meters east of tall hedge, and 15 meters south of hedge making angle with hedge to east True bearings left tip of radio mast, 118° 30' 1, telephone-pole, 186° 22' 0, right edge of hut, 336° 33' 0

San José, Guatemala, 1923, 1926—About 100 feet (30 meters) west of C I W station of 1909, 250 feet (76 meters) west of road parallel to railroad and passing west of Hotel California leading to comandancia by the sea, and 220 feet (67 meters) northeast of thatched shed, marked by peg True bearings gable of Pier Company's quarters, 18° 00' 5, flagpole on new (1926) train-shed, 328° 28' 3, flagpole on United States consulate, 337° 10' 5, highest gable of roof of comandancia, 353° 34' 9

San Salvador, Salvador, 1923—The C I W station of 1909 being unavailable, two stations, *A* and *B*, were occupied in southeastern part of city, just west of Parque Modelo Station *A* is on first level of hill rising in two steps about 80 feet (24 meters) above auto road running around its base, about 250 paces northeast of concrete tank on top of hill, 8 5 feet (2 6 meters) south of north edge of hill overlooking city, and 18 0 feet (5 5 meters) north of south edge overlooking fort and agricultural school, marked by stake 2 by 2 inches (5 by 5 cm) set to within 4 inches (10 cm) of surface True bearings spike on water-tank, 65° 16' 8, spire of clock-tower of red church, 151° 38' 1, east spire of church, 181° 53' 6, spire of large dome of cathedral, 211° 44' 8, top center of west wireless tower, 292° 13' 0, south edge of turret of fort, 321° 17' 2

Station *B* is on second rise of hill, between station

NORTH AMERICA

CENTRAL AMERICA—*continued*

San Salvador, Salvador, 1923—continued
A and concrete tank, in center of small path leading up hill to tank, 103 paces northeast of tank, 15 0 feet (4 57 meters) from south edge of hill, and 20 0 feet (6 10 meters) from north edge, marked by 2-inch (5-cm) round stake driven to within 4 inches (10 cm) of surface True bearings spike on concrete tank, 48° 08′ 5, center of clock-tower of red church in town, 158° 13′ 5, top center of west wireless tower, 283° 24′ 9, south edge of turret of fort, 312° 31′ 0

Tegucigalpa, Honduras, 1923—Two stations were occupied Station *A* is practical reoccupation of C I W station of 1909 In vacant plot lying north of the quartel and comandancia close by Quaserique Bridge over Tegucigalpa River, 90 7 feet (27 65 meters) north of Calle 13, 132 5 feet (40 39 meters) east of street on west side of plot, 147 5 feet (44 96 meters) west of paved street which is first street west of San Lorenzo Road, and 54 feet (16 5 meters) south of intersection of two paths crossing plot diagonally, marked by a 2-inch (5-cm) stake set flush with surface True bearings center of door of lone house on hill, 160° 42′ 5, tip of cone on church, 205° 52′ 2, tip of obelisk of monument to Central American Republic, 253° 01′ 2

Station *B* is in northwestern part of city, on east side of Tegucigalpa River, on rocky hill belonging to Mr Gilbert, about 100 yards (91 meters) southeast of remote control station of Tropical Radio Company, formerly called Mira Mesi, 250 feet (76 meters) west of fence-line around Gilbert house, 12 feet (3 7 meters) south of north crest of hill, and 6 feet (1 8 meters) north of south crest of hill, marked by a post 3 by 2 inches (8 by 5 cm) driven to within 6 inches (15 cm) of surface True bearings gable of National Theater, 6° 48′ 8, cross on church near river, 10° 50′ 4, top center of west wireless station, 5 kilometers, 22° 01′ 2, southeast edge of new quarters of remote control station, 200° 16′ 4, weather-vane of house on hill northeast of city, 320° 59′ 6

Tikal, Guatemala, 1923—On Pyramid No 1, on southwest corner of 4-foot (1 2-meter) ledge running around base of temple 135 feet (41 15 meters) above ground (No magnetic observations at this station)

Truxillo, Honduras, 1923—Two stations were occupied Station *A* is close reoccupation of C I W station of 1909 On hard clay strip of soil running along beach just below northeast corner of old fort on hill, about 300 paces along road leading from railroad station to Carib Town, 45 0 feet (13 72 meters) west of ditch leading to sea, 18 0 feet (5 49 meters) northwest of barbed-wire fence at base of hill, and 4 8 feet (1 46 meters) southeast of border-line of clay soil and sandy beach, marked by peg driven flush with surface True bearing water-tank at Puerto Castilla, 7 miles (11 km), 169° 02′ 3

Station *B* is on top of small hill southeast of and overlooking main part of town, east of street running south from Steiner's Hotel and winding path leading from street at a point near a culvert, 60 feet (18 3 meters) from west edge and 80 feet (24 4 meters) from east edge respectively of crest of hill, 45 8 feet (13 96 meters) northeast of large tree, and 47.2 feet (14 39 meters) southeast of large tree, marked by stake driven flush with surface True bearing tip of nearest church steeple, 83° 16′ 5

NORTH AMERICA

CENTRAL AMERICA—*concluded*

Uaxactun, Guatemala, 1923—In "aquada" known by name of "Bambonal," midway across northern end, on line of sight running between two cities

Ucanal, Guatemala, 1923—In clearing known as "Salspuede," about 300 yards (274 meters) from main ruins in a southeast direction, 150 feet (46 meters) due west of Mopan River at a point where a clearing has been made to water's edge

Uolantun, Guatemala, 1923—At west side of pyramid, 30 feet (9 1 meters) south of two monuments lying together at base of pyramid (No magnetic observations at this station)

Uvita Island, Costa Rica, 1923—About 150 feet (46 meters) southwest of C I W station of 1907, now unsuitable owing to erection of new steel lighthouse On hill, about 250 feet (76 2 meters) west of lighthouse, 23 8 feet (7 25 meters) west of northwest concrete footing of wing of abandoned quarantine hospital, 18 7 feet (5 70 meters) north of northwest footing of main building of hospital, about 25 feet (7 6 meters) from north edge and about 35 feet (10 7 meters) from west edge of crest of hill, marked by stake projecting 4 inches (10 cm) and marked by copper tack True bearings smoke-stack of railroad power shop, 74° 27′ 0, center top of west wireless tower, 108° 20′ 0, center top of east wireless tower, 109° 56′ 6, gable on north house of hospital, 113° 32′ 1, tip of light on island, 265° 33′ 5

Wawa Sawmill, Nicaragua, 1923—On east bank of Wawa River, at camp known as The Boom, in center of path running along river at a point 100 yards (91 meters) south of office and store of Mr Beer, marked by stake driven flush with surface True bearing southeast edge of outhouse in rear of Mr Beer's office, 221° 18′ 8

Xmakabatun, Guatemala, 1923—At entrance to ruins just west of first pyramid on left-hand side approaching ruins, on Plaza No 1, about 50 feet (15 meters) northwest of first monument of series scattered on plaza

Xultun, Guatemala, 1923—In a "jato" or clearing of Don Urrita, among a large number of mounds and small pyramids within a radius of one-half mile (0 8 km) (No magnetic observations at this station)

Zacapa, Guatemala, 1926—Practical reoccupation of C I W station of 1907, about one-fourth mile (0 4 km) east of railway station, south of new road to old Zacapa, 40 feet (12 2 meters) north of center of new road near highest point of conspicuous knoll, 3 meters southwest of lone cactus, marked by peg with brass ferrule True bearings figure 1 of scale of gage on large tank at railroad, 46° 40′ 0, left belfry tower of cathedral in Zacapa, 250° 38′ 3, right belfry tower, 251° 22′ 3, tower at entrance to cemetery, 263° 06′ 8

GREENLAND

Akpam (Parker Snow Point), 1924—At Parker Snow Point, about 4 miles (6 4 km) east of Conical Rock, and about 30 miles (48 km) west of Cape York, at an Eskimo settlement where there are generally a few families to hunt walrus and akpa (birds which breed in cliffs here) Main station is on grassy slope above mossy bog, at foot of talus slope, marked by a tent-peg and a small pile of stones over the peg True bearing Vertical face of cliff on southwest side of harbor entrance, 49° 49′ 8

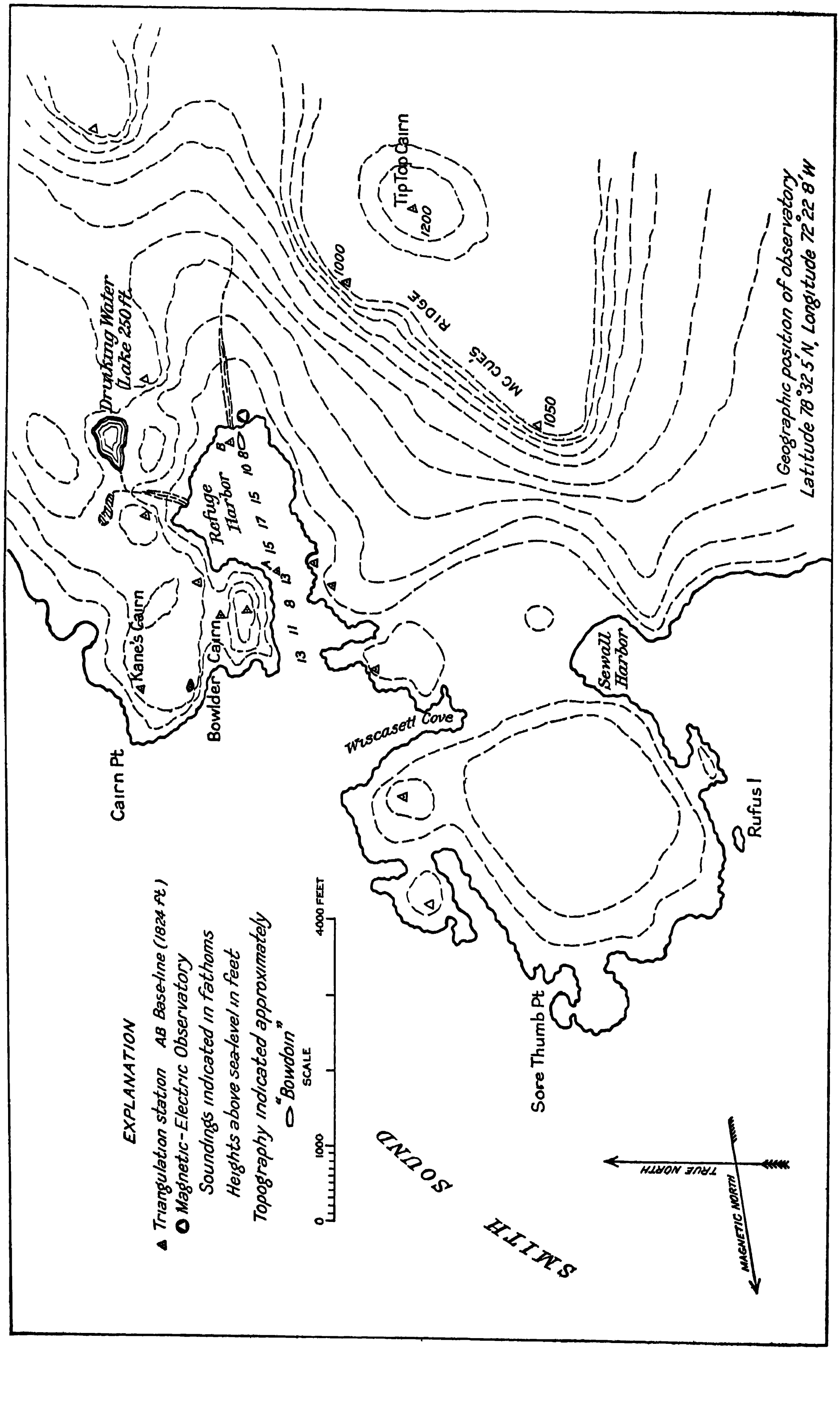

FIG 2—Plane-table survey, Refuge Harbor Winter-Quarters, MacMillan North Greenland Expedition, 1923-1924

NORTH AMERICA

GREENLAND—*continued*

Akpani (Parker Snow Point), 1924—continued An auxiliary station was occupied on beach just above high-water mark where beach is covered with small boulders and gravel, marked by a small cairn of waterworn stones True bearing vertical face of cliff on southwest side of harbor entrance, 52° 04′ 4 (This place should be distinguished from a settlement having the same name on Saunders Island)

Etah, 1923—Exact reoccupation of C I W station of 1908 About 400 feet (122 meters) north of extreme end of Reindeer Point, due north of coal depot, 55 4 feet (16 89 meters) south of bottom of ledge of rock, and 97 8 feet (29 81 meters) east of foot of vertical stratum of rock in ledge on west, marked by a pile of rocks True bearing step in cliff to left of John's Glacier, 283° 28′ 7

Godthaab, 1923, 1924—Close reoccupation of H M S *Bulldog* station of 1860, on small island in northern arm of Godthaab Havn, near center of island and at about highest point, marked by a tent-peg with a cairn erected over peg True bearings cairn on hill, 1 4 kilometers, 15° 50′ 0, rod on cliff west of anchorage, 41° 16′ 2, right edge at base of cairn, one-half kilometer, 133° 42′ 2

Godhavn, Disco Island, 1924—Close reoccupation of C I W station of 1908 In a small valley south of village and wharf between two ledges of rock on an area best suited for driving pegs and erecting tent, marked by tent-peg under a cairn of stones, and witnessed by two 1-inch holes about 1 inch deep in adjacent outcropping ledges, one at 8.2 feet (2 5 meters) west in a small hog-back ledge, and the second in small outcrop 8 6 feet (2 6 meters) south True bearings middle of base of flagstaff, 10° 18′ 5, flagpole on bluff across harbor, 232° 09′ 3, center at base of main flagpole, 232° 17′ 2, vertical edge of cliff above step, 244° 03′ 2

Holstensborg, 1924—Probably about one-fourth mile (0 4 km) east of C I W station of 1908, north of village on southern side of mouth of fiord, on a small patch of level ground, 112 feet (34 14 meters) northeast of corner of little stone powder-magazine painted white, and 73 feet (22 25 meters) southeast of wooden triangle painted red which is front range of pair of anchorage ranges, rear range being triangle painted on ledge about 82 paces east of station, marked by tent-peg covered by cairn of stones True bearings top of short staff on roof of powder-magazine, 57° 38′ 0, beacon on island off south entrance 81° 38′ 8, cairn on mountain-top across fiord, 171° 25′ 2

Keate, Northumberland Island, 1924—On southeast side of Northumberland Island overlooking Whale Sound, east of a glacier having fresh lateral moraines, the only glacier on south side of island, east of a summer stream, 25 paces northeast of a boulder near mouth of stream, and 35 paces west of boulder near some meat caches, marked by a tent-peg and small cairn of rocks over the peg True bearing end of Cape Parry, 17 miles (27 4 km), 352° 25′ 6

Refuge Harbor, 1923, 1924—Winter-quarters of the MacMillan North Greenland Expedition, on northwest coast of Greenland, in a natural harbor on Smith Sound at the entrance to Kane Basin, about 20 miles (32 km) north of Etah A temporary variation observatory was constructed in which magnetograph instruments were operated during the winter, with absolute observations made in an outside station

NORTH AMERICA

GREENLAND—*concluded*

Refuge Harbor, 1923, 1924—continued tion True bearings from absolute station night cairn, 4° 04′ 1, boulder cairn on hill at north entrance to harbor, one-half mile (0 8 km), 96° 35′ 1 The absence of natural objects of reference makes a detailed description of position impossible, but the general location is well shown by the topographic sketch made by the observer and included with his report (see Fig 2)

MEXICO

Campeche, Campeche, 1924—West of main section of town in an open space west of an old fort and north of a large park or plaza, about 450 feet (137.2 meters) from shore-line of Bay of Campeche, 268 0 feet (81 69 meters) southwest of southwest corner of fort, 147 5 feet (44 96 meters) southeast of southeast corner of an old building, marked by cross in irregular stone buried about 4 inches (10 cm) below ground True bearings top of dome of pavilion, 33° 10′ 9, left spire of cathedral, 241° 01′ 3, right spire of cathedral, 242° 43′ 4

Chichen Itza, Yucatan, 1924—Amidst the old Maya ruins between Temple of Castillo and temple of the Tigers, 237 0 feet (72 24 meters) west of center of bottom step of the Castillo mound, 207 4 feet (63 22 meters) north of center rod of nearby windmill, and 185 5 feet (56 54 meters) southwest of prominent tree, marked by cross and letters "C I W 1924" cut in top of stone set to project 4 inches (10 cm) above ground True bearings southeast corner of wall of Temple of the Tigers, 108° 57′ 1, prominent tree, 180° 48′ 7, southwest corner of Castillo mound, 309° 59′ 1, center rod of windmill, 358° 02′ 7

Chihuahua, Chihuahua, 1924—Three stations were occupied Station *A* is a close reoccupation of C I W station *A* of 1906, about 1 5 miles (2 4 km) southwest of center of city and about one-third mile (0 5 km) southwest of Guadalupe Church, in open space southeast of an old abandoned fort, 60 feet (18 3 meters) northeast of northeast high stone wall surrounding fine residence, 17 feet (5 2 meters) southeast of line of northwest stone wall extended, and about 180 feet (54 9 meters) southwest of adobe wall surrounding a large garden on opposite side of street True bearing cross on Guadalupe Church, 222° 49′ 2

Station *B* is a close reoccupation of C I W station *B* of 1906, in eastern part of city, 358 5 feet (109 27 meters) south of southerly corner of Gustabo A Madero Hospital formerly the Porfirio Diaz, 221 2 feet (67 42 meters) from easterly corner of a building to northwest and in direct line of front of this building extended, marked by cross cut in top of existing cement boundary monument about 9 inches (23 cm) square extending about 12 inches (30 cm) above ground True bearings tower of Trinity or American church, 1 mile (1 6 km) 43° 50′ 1, left tower of cathedral, 1 mile (1 6 km) 60° 36′ 0, higher of two towers on residence, 200 meters, 148° 01′ 6, flagstaff on hospital, 200 meters, 169° 31′ 8

Station *C* is about 200 yards (183 meters) west of *A*, across a deep gulch, on open land 128 feet (39 0 meters) south of the outer edge of trench surrounding old abandoned circular fort built of adobe and stone Observations were made over an existing stone and mortar boundary monument, about 14 by 22 inches (36 by 56 cm) and extending 16 inches (41 cm) above ground True bearings tip of water-tank at railroad, 2 miles (3 2 km), 205° 35′ 4, right

NORTH AMERICA

MEXICO—*continued*

Chihuahua, Chihuahua, 1924—continued
tower of cathedral, 1 5 miles (2 4 km), 224° 58′ 6, cross on Guadalupe Church, 231° 05′ 9

Culiacan, Sinaloa, 1924—About 1 mile (1 6 km) south of cathedral in city, on land belonging to Catholic Church, about 75 meters east of a chapel on a hill which is approached from north by a long series of broad cement steps, and 15 feet (4 6 meters) north of line of north front of chapel extended, marked by cross cut in firmly embedded stone projecting slightly above ground True bearings left spire of cathedral, 175° 25′ 2, right spire of cathedral, 175° 26′ 3, tip of dome on cathedral, 176° 37′ 9

Frontera, Tabasco, 1924—One mile (1 6 km) north of main plaza, in northeast corner of baseball field, 51 feet (15 5 meters) from tree to northwest, 50 feet (15 2 meters) from tree to northeast, and 48 feet (14 6 meters) from wooden fence on east side of baseball field, marked by quart bottle buried 6 inches (15 cm) below the surface True bearings flagpole over entrance to baseball field, 10° 22′ 1, top of chimney on sawmill, 59° 17′ 4

Guadalajara, Jalisco, 1924—Two stations were occupied Station *A* is about 2 5 miles (4 0 km) northwest of city on open land just south of American suburb Colonia Seattle, on east side of boundary ditch or trench, 23 8 feet (7.25 meters) northeast of nearest monument of a group of three boundary monuments, 31 0 feet (9 45 meters) from monument west of ditch, 28 6 feet (8 72 meters) from center of smaller monument in bottom of ditch, 10 5 feet (3 20 meters) east of edge of ditch, and 53 feet (16.2 meters) west of center of slightly graded roadway, marked by cross cut in rough stone buried slightly below surface of ground True bearings tip of isolated tower, 1 mile (1 6 km), 45° 05′ 7, tip of small dome between two tall towers on church at Zapopan, 111° 52′ 1, spire of village church three-fourths mile (1 2 km), 263° 41′ 9, right spire of cathedral, 2 5 miles (4 0 km), 324° 13′ 0

Station *B* is about 200 meters north and slightly east of *A*, east of deep gulch, 22 6 feet (6 89 meters) southeast of nearer and larger of two boundary monuments, 28 1 feet (8 56 meters) from second monument in bottom of ditch, and 94 feet (28 7 meters) west of center of slightly graded roadway leading from Guadalajara to Colonia Seattle, marked by notch cut in upper edge of fragment of sandstone buried slightly below surface of ground True bearings tip of isolated tower, 43° 37′ 8, tip of dome between two towers on church in Zapopan, 104° 54′ 5, spire of village church, 272° 47′ 8, right spire of cathedral, 326° 14′ 1

Guaymas, Sonora, 1924—Two stations were occupied Station *A* is nearly 2 miles (3 2 km) west of city along only road in that direction, 63 feet (19 2 meters) north of center of road nearly opposite a small house in a cluster of trees, 123 2 feet (37 55 meters) northwest of hydrant for filling tank wagons, and 103 feet (31 4 meters) from pipe-line measured at right angles, marked by cross and letters "C I" cut in top of firmly embedded stone projecting about 5 inches (12 7 cm) above ground True bearings sharp finger of rock on mountain, about 5 kilometers, 36° 01′ 3, tip of cupola on residence of Dr Carlos Gutierrez, 1 mile (1 6 km), 267° 00′ 5, cleft in top of finger rock projecting from left wall of mountain, 1 5 miles (2 4 km), 329° 52′ 9

Station *B* is a close reoccupation of C I W station of 1906, on small island in the harbor about 3 miles (5 km) east of town, 60 yards (55 meters) from southwest side and 90 yards (82 meters) from northeast side of island, about 180 paces southeast of foot of steep, rocky face of Morro Ingles, now more frequently called "El Morito", 100 paces east of east end of a rock fill about 6 feet (2 meters) high, 50 feet (15 meters) wide, and 80 yards (73 meters) long, extending eastwardly from Morro Ingles True bearings tip of left tower of cathedral, 2 5 miles, (4 0 km), 107° 30′ 2, tip of right tower of cathedral, 107° 45′ 0, right side of tall chimney just to right of water-tower in Empalme, 4 miles (6 4 km), 211° 00′ 5, tip of lighthouse tower at west end of Isla de Pajaros, 3 miles (4 8 km), 354° 25′ 6

Hermosillo, Sonora, 1924—Close reoccupation of C I W station of 1906, in eastern part of town, near northeast corner of Parque Francisco I Madero, formerly Parque Ramon Cerral, 104 2 feet (31 76 meters) west of northwest corner of new brick normal school, 17 7 feet (5 39 meters) south of line of north wall of school extended, 37 6 feet (11 46 meters) south of line of trees along south side of driveway, 27 0 feet (8 23 meters) and 13 3 feet (4 05 meters) respectively from orange trees to southeast and northwest, and 14 8 feet (4 51 meters), 22 0 feet (6 71 meters), 23 4 feet (7 13 meters), and 16 2 feet (4 94 meters) respectively from date-palm trees to northeast, northwest, southwest, and southeast True bearings pinnacle rock at right side of flat top of rocky hill in eastern part of town, three-fourths mile (1 2 km), 53° 41′ 0, electric-light pole at west end of park, 200 yards (183 meters), 82° 09′ 1, point of rock on mountain seen just to right of southwest corner of new brick normal school, 5 miles (8 km), 320° 22′ 3

Mazatlan, Sinaloa, 1924—Two stations were occupied Station *A* is about one-half kilometer south and slightly west of central part of town, about 150 meters northeast of meteorological and seismological observatory, near center of shoulder of hill inclosed by second sharp turn of old road leading down from observatory to Mazatlan, marked by cross cut in rough stone set to project about 2 inches (5 0 cm) above ground True bearings tip of lighthouse tower, 11° 48′ 7, left tower of cathedral, one-half mile (0 8 km), 193° 26′ 0, right tower of cathedral, 194° 15′ 8

Station *B* is about 229 meters south and slightly east of *A*, about 150 meters southeast of meteorological observatory, about 50 paces north of old cannon on the point overlooking the sea and almost in direct line with its barrel, and 87 feet (26 5 meters) northwest of remains of old stone wall, marked by cross in center of rough stone set to project slightly above ground True bearings tip of lighthouse, 15° 01′ 2, left spire of cathedral, 190° 33′ 5, right spire of cathedral, 191° 18′ 0

Merida, Yucatan, 1924—Two stations were occupied Station *A* is located on grounds of Agricultural School in Chuminopolis, a suburb east of Merida, about 4 miles (6 4 km) from main plaza, in a field east of main buildings, and 248 4 feet (75 71 meters) east of a stone gate-post, marked by cross cut in stone 6 by 14 by 28 inches (15 by 35 by 71 cm), lettered "A" and set flush with ground True bearings distant windmill, 191° 35′ 3, left edge of water-tank, 221° 11′ 3

Station *B* is 210 2 feet (64 07 meters) north of *A*, marked by cross cut in top of stone flush with

NORTH AMERICA

MEXICO—*continued*

Merida, Yucatan, 1924—continued
ground True bearings distant windmill, 192° 00′.6, second windmill, 233° 45′.2

Monterrey, Nueva Leon, 1924—Two stations were occupied Station *A* is a practical reoccupation of C I W station of 1907, on grounds of city waterworks, about 1 mile (1.6 km) west of central part of town, near northwest corner of reservoir inclosure which is used also as golf course, 95.4 feet (29.08 meters) from fourth post from corner along north fence, 65.1 feet (19.84 meters) from seventh post from corner along west fence, and 53.8 feet (16.40 meters) from palm tree to southeast, marked by cross in rough stone set to project about 1 inch (2.5 cm) above ground True bearings tip of tower on brewery, 1 mile (1.6 km) 231° 14′.2, dome of Trinity Church, 1 mile (1.6 km), 266° 17′.2, tall church spire in Monterrey, 289° 26′.0, dome of cathedral, 1 mile (1.6 km), 291° 59′.2

Station *B* is 155.0 feet (47.24 meters) southeast of *A*, marked by cross cut in rough stone set flush with ground True bearings tip of tower on brewery, 230° 23′.6, spire of Trinity Church, 265° 25′.7, tall church spire, 289° 01′.9, tip of central dome of new cathedral, 291° 27′.9, church spire, 307° 13′.3

Nueva Casas Grandes, Chihuahua, 1924—Close reoccupation of C I W station of 1906, on land belonging to Mexican and Northwestern Railway, 210 paces northeast of railway station, 150 paces east of the railway measured from point 25 paces north of water-tank, 200.0 feet (60.96 meters) west of line of buildings on east side of open square, 207.3 feet (63.18 meters) northwest of northwest corner of one-story brick store, and 124.0 feet (37.80 meters) from adobe wall surrounding yard of new adobe house to north True bearings vertical side, near bottom, of cleft in mountain, 11° 47′.4, flagstaff on cuartel, 53° 20′.0, tip of water-tank, 77° 50′.5, vertical wall of mountain, 116° 29′.3

Oaxaca, Oaxaca, 1924—Close reoccupation of C I W station of 1907, west of town on west bank of Oaxaca River, 48 feet (14.6 meters) north of road leading to San Juanita Cathedral, and 12 feet (3.7 meters) south of irrigation ditch, marked by cross and letters "C I W 1924" cut in top of rock set flush with ground True bearings flagstaff, statue of Juarez, three-fourths mile (1.2 km), 207° 09′.2, dome to left of cathedral, 229° 15′.6, cross on cathedral, 242° 51′.6, dome to right of cathedral, 249° 42′.4

Station *B* is 150 feet (45.7 meters) across the Oaxaca River from *A* on direct line to cross on cathedral and 21.5 feet (6.56 meters) from river bank, marked by cross cut in small irregular rock True bearings dome to left of cathedral, 228° 01′.6, cross on cathedral, 242° 51′.6

Puebla, Puebla, 1924—Two stations were occupied Station *A* is on Guadalupe Hill, about 2 miles (3.2 km) east of central part of city and about one-half mile (0.8 km) southeast of city water-works tower It is 28 paces northwest of an old fort on top of Guadalupe Hill and 128 feet (40.0 meters) northeast of winding road leading up to fort, marked by cross and letters "C I W" on top of stone set flush with ground True bearings church spire, 36° 06′.3, left tower of cathedral, 52° 32′.7, steeple of fort on distant hill, 89° 36′.0, top of water-works tower, 121° 19′.3

Station *B* is 338 feet (103.0 meters) from *A* and in direct line to left tower of cathedral, marked by cross in stone projecting slightly above ground

NORTH AMERICA

MEXICO—*continued*

Puerto Mexico, Vera Cruz, 1924—Two stations were occupied Station *A* is north of main town, on north end of a small rise on hill about one-fourth mile (0.4 km) west of main lighthouse and approximately 20 feet (6.1 meters) from north edge of this rise, marked by cross cut in top of rough stone set to project 2 inches (5 cm) above ground True bearings distant telegraph-pole, 176° 43′.2, top of main lighthouse, 269° 49′.5, right corner of house on hill, 356° 08′.2

Station *B* is 88.6 feet (27.01 meters) south 34° 16′ east from *A*, on south end of same rise, and 155.0 feet (47.24 meters) northeast of more northerly of two palm trees, marked by cross in rough stone set flush with ground True bearings distant telegraph-pole, 175° 56′.5, top of main lighthouse, 264° 22′.2, top of distant lighthouse, 317° 21′.2

Queretaro, Queretaro, 1924—Four primary and two secondary stations were occupied Station *A* is about 1.5 miles (2.4 km) west of center of city on a low hill locally known as "Cerro de las Campanias," the place of execution of Emperor Maximilian in 1867, on northwesterly rim of circular summit and 80 yards (73 meters) northwest of a small memorial chapel which stands at foot of steepest part of hill on southeasterly side, marked by cross in flat, oblong stone firmly embedded flush with ground True bearings tip of dome on small country church, 95° 32′.9, tip of bell-tower on small church, 162° 37′.6, cross on dome to left of bell-tower on cathedral, 270° 31′.0, cross on dome of large bell-tower of cathedral, 271° 55′.9, spire to left of dome on Santa Rosa Church, 291° 47′.4

Station *B* is about one-fourth mile (0.4 km) south and slightly east of *A*, 115 feet (35.05 meters) west of a dirt road leading up to Maximilian's tomb on hill, 83 feet (25.3 meters) northwest of conspicuous rock pile, and 322 paces south of Maximilian's tomb, marked by cross cut in rough stone set to project 2 inches (5.1 cm) above ground True bearings station *A*, 165° 32′.4, spire on extreme left round dome, 253° 35′.3, central church in Queretaro, 266° 05′.4, extreme right church in Queretaro, 281° 31′.6

Station *C* is a close reoccupation of Mexican station of 1922 and is about 2 miles (3.2 km) east and slightly north of station *A*, northeast of city, on Cañada Road, on grounds of chapel of San Isidro, 87 meters north of chapel, and about 150 meters south of Queretaro River True bearing lightning-rod on top of large brick chimney, 103° 00′.0 Inclination was observed at *Secondary C*, 30 feet (9.14 meters) west of *C*, in line with lightning-rod

Station *D* is about 1 mile (1.6 km) southwest of *A*, at extreme southerly edge of town, three squares west of street leading to the central plaza, and near the northerly edge of a very wide roadway True bearing spire of small church visible through opening in trees, 190° 06′.6 Inclination was observed at *Secondary D*, 30 feet (9.14 meters) from *D* in line with spire of small church

Sabinas, Coahuila, 1924—Two stations were occupied Station *A* is a practical reoccupation of C I W station of 1907, in open square in north corner of town, about one-third mile (0.5 km) northwest of railway station, and about 430 yards (393 meters) southwest of a spur of railroad, 141.5 feet (43.13 meters) from westerly corner of adobe dwelling, 128.5 feet (39.17 meters) from wire fence across road to northwest, 96.0 feet (29.26 meters) from picket fence to southeast, and 98.8 feet (30.11 meters) from corner of adobe wall around inclosure, marked by cross in

NORTH AMERICA

MEXICO—*concluded*

Sabinas, Coahuila, 1924—continued
large rough stone set nearly flush with ground True bearings ventilator on brewery, one-half mile (0 8 km), 162° 21′ 2, ball on weather-vane, one-fourth mile (0 4 km), 332° 47′ 0

Station *B* is 51 5 feet (15 70 meters) from *A* and in direct line to ventilator on brewery

San Luis Potosi, San Luis Potosi, 1924—Close reoccupation of Mexican station of 1922, in center of large patio of Industrial Military School, 1,200 meters south of cathedral on paved road leading to Sanctuary of Guadalupe, 144 5 feet (44 04 meters) southeast of east corner of shed along north brick wall of patio, and 126 5 feet (38 56 meters) northwest of corner of old wall, marked by cross and letters "C I W 24" in top of well-cut stone projecting 3 inches (8 cm) above ground True bearings top of left edge of battlement, 14° 41′ 3, telegraph-pole seen over roof of school, 58° 42′ 7, left side of distant telegraph-pole, 228° 48′ 4, left edge of chimney, 285° 39′ 3

Tampico, Tamaulipas, 1924—Six miles (9 7 km) northeast of center of town, in extreme northeast part of Gorges Hospital grounds, 38 0 feet (11.58 meters) southeast of fifteenth post of northwest fence, and 97 5 feet (29 72 meters) north of southeast corner of one of the hospital buildings, marked by cross cut in top of irregular stone set 5 inches (13 cm) below surface of ground True bearings· corner of house, 131° 37′ 3; chimney on distant house, 197° 30′ 7, flagpole on Mexican hospital, 336° 19′ 4

Teoloyucan, Mexico, 1924—Three stations were occupied for intercomparisons at the National Magnetic Observatory of Mexico *Pier A* and *Pier B* are in absolute house and are regular magnetometer and earth-inductor piers respectively

Station *B* is 23 4 meters east of absolute house in path leading from variometer building to entrance of grounds All three stations are in line with northwest corner of church tower whose true bearing is 276° 41′ 0

Tepic, Nayarit, 1924—In small park at western edge of town nearly in extension of center of Calle de Lerdo, 185 0 feet (56 39 meters) west of corner of buildings on north side of Calle de Lerdo, 181 5 feet (55 32 meters) from corner of building on south side of this street, and 101 8 feet (31 13 meters) east of fence beyond driveway west of park, marked by cross cut in rough stone set flush with ground True bearings left spire of cathedral, one-half mile (0 8 km), 287° 14′ 9, right spire of cathedral, 288° 06′ 4

Vera Cruz, Vera Cruz, 1924—About 3 miles (4 8 km) south of center of town, approximately one-half mile (0 8 km) south of amusement park, Villa del Mar, on beach on prominent sand-bank covered with grass and shrubbery, approximately 300 yards (274 meters) east of telegraph-line, 150 feet (45 7 meters) from the shore-line, and 15 feet (4 6 meters) west of eastern edge of sand-bank, marked by bottle buried 6 inches (15 cm) below surface True bearings top of wireless tower, 124° 49′.8, top of main lighthouse, 154° 57′ 8, beacon-light on island, 226° 01′ 1

NEWFOUNDLAND

Battle Harbor, Labrador, 1921, 1922, 1923—Station *C* of 1914 was exactly reoccupied in 1921 and 1923 in a hollow extending northwest and southeast near center of Battle Island, about 500 feet (152 meters) east of English church, about same distance north of wireless telegraph station, and about 15 feet (5 meters) east of a natural step in rock about 2 feet (0 6 meter) high, marked by shallow drill-hole in the rock, and three shallow holes for the tripod legs True bearings, tower of lighthouse on Double Island, 318° 36′ 1, north gable of wireless station house, 336° 53′ 0

NORTH AMERICA

NEWFOUNDLAND—*continued*

Station *D* of 1914 was exactly reoccupied in 1921 and 1922, 75 9 meters northwest of station *C* very nearly in reversed azimuth of lighthouse on Double Island, on highest point of Battle Island, 250 4 meters northwest of middle of gable of wireless operator's house, marked by a 1-inch (3-cm) drill-hole in solid rock with 3 shallow drill-holes for tripod legs True bearing tower of lighthouse on Double Island, 318° 46′ 3

Bonne Bay (Woody Point), 1921 A little east of narrow lane leading north from village, west of lighthouse with flashing red light, on Woody Point, and nearly in line with lighthouse and steeple on red roof of Church of Good Shepherd. Spire of Methodist church bears 38° 11′ west of magnetic south

Cartwright, Labrador, 1922—On shore, opposite Hudson's Bay Company's post Bottom of flagpole at Porter's station bears 20° 00′ east of magnetic north

Grady, Labrador, 1923—Exact reoccupation of C I W station of 1914, and according to statements of old men living there, an exact reoccupation of station of S W Very of 1881 though the drill-hole marking the point was about 4 inches deep instead of 10¾ inches as reported for 1881, on Little Grady Island, 24 feet (7 3 meters) northeast from northeast corner of the agent's house and 10 feet (3 0 meters) south of south end of nearest fish flake; marked by a drill-hole 4 inches (10 cm) deep in solid rock. True bearings flagstaff, 5° 19′.8

Hopedale, Labrador, 1923, 1924—The station of 1923, called station *A*, was a close reoccupation of that of 1914, which was not permanently marked; that of 1924, called station *B*, was at very nearly the same point On ledge about 200 yards (183 meters) east of Moravian Mission, a short distance east of the highest point of the exposed rock, and south of pool of water in depression of ledge, station *A* not marked True bearings from *A* beacon west of mission, 94° 42′ 1, mission church, 103° 27′.3, beacon on hill, 135° 49′ 6 Station *B*, within 10 feet of station *A*, was marked by three 1-inch (2.5-cm) drill-holes for tripod and a small rock cairn over center.

Nain, Labrador, 1922—Close reoccupation of United States Coast and Geodetic Survey station of 1881, about one-fourth mile (0 4 km) north 15° east from flagstaff in front of mission house, and near some large boulders known as Martin's Stein, on shelf of dry, gravelly soil, bordered by lower marshy strip a few hundred yards in width on which is a windlass for hauling up boats, at point 13 6 feet (4 14 meters) from juniper post marking station of 1881 and 12.4 feet (3 78 meters) from large boulder southwest of juniper post on line joining middle of boulder and post True bearing small boulder on hill across harbor approximately on line bisecting angle between old capstan and small lone house on shore, 323° 29′ 0

Port Burwell, B, Labrador, 1922—Exact reoccupation of C I W. station *B* of 1914, on west shore of Port Burwell, on neck of land between harbor and a salt-

NORTH AMERICA

NEWFOUNDLAND—*concluded*

Port Burwell, B, Labrador, 1922—continued water pond, and west across harbor from Hudson's Bay Company's post, marked by charred stick covered by cairn of stone 1 5 meters high True bearing low beacon on rock east of point of land, 218° 09′ 9

Red Bay, Labrador, 1923—On northern side of Saddle Island, on mossy ground, 15 paces above high-water mark where grass ends and gravel beach begins, 16 paces east of small inclosed garden of lighthouse keeper, marked by juniper peg driven nearly flush with surface of moss and covered with a small rock cairn True bearings right edge of lighthouse tower, 60° 24′ 9, base of stick on rock cairn across harbor, 93° 04′ 0, Methodist church spire across harbor, 197° 07′ 4

Rigolet, Labrador, 1922—In a small clearing of evergreen trees, 120 yards (110 meters) from Hudson's Bay Company's cook-house, and 40 feet (12.2 meters) from high-water line, marked by pine stake driven 2 feet (0 6 meter) into ground and projecting 1 foot (0 3 meter) above ground True bearings Burns Cove beacon on northern side of bay, one and three-fourths miles (2 8 km), 221° 18′ 4, western corner of house near water's edge at Hudson's Bay Company's fishing-station at Lister Point on southern side of bay, 4 miles (6 km), 240° 06′ 0, Hudson's Bay Company's cook-house, northern corner, on harbor side of bell-tower, 294° 00′ 0, flagpole at lowest section visible over roof of small house, 303° 10′ 5

A secondary station established about three-fourths mile (1 2 km) from main station, across harbor towards Burns Cove beacon, indicated local disturbance

St Johns, C, Newfoundland, 1922—Exact reoccupation of C I W station C of 1909, 85 feet (25 9 meters) from center of stone marking 1881 station, 86 feet (26 2 meters) from north fence, 129 9 feet (39 60 meters) from west fence, and 169.3 feet (51.60 meters) from northwest corner of fence, marked by standstone block lettered "C I W 1909" on top, a hole at center defining exact position True bearing Congregational church spire, 5° 09′ 5

UNITED STATES

Bristol, Virginia, 1925—Station of United States Coast and Geodetic Survey was exactly reoccupied, on campus of Virginia Intermont College, about 30 feet (9 meters) east of center of cemented driveway, measured from point 106 feet (32 3 meters) along driveway from pillars at entrance, 127 7 feet (38 93 meters) nearly due south of southwest post at front steps of main building, marked by limestone post projecting about 2 inches (5 cm) above surface and lettered "U S C &G S 1898" True bearings left edge of chimney on rear of church, one-fourth mile (0 4 km), 1° 48′.2, distant flagpole, 1 5 mile (2 4 km), 8° 01′ 6, church spire seen at left of entrance to grounds, 37° 48′ 4, southwest corner of east building of college above stone course, 200 feet (61 meters), 235° 48′.2, top of railroad water-tower, 279° 46′ 3, right edge of stack of Columbia Paper Company, 299° 56′ 5, flagpole on public school, one-half mile (0 8 km), 337° 36′ 0 Unlettered stone near hedge bounding grounds marks meridian line, and is 120 5 feet (36 73 meters) south of station

Bunnell, Florida, 1925—Two stations were occupied Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1920, in an

NORTH AMERICA

UNITED STATES—*continued*

Bunnell, Florida, 1925—continued open field near southeast side of extension of Lambert Avenue, at point about 700 feet (213 meters) southwest of railroad, 69 feet (21 0 meters) southwest of pasture fence, 45 feet (13 7 meters) west, and 23 feet (7 0 meters) north respectively from two large pine trees, marked by concrete post, 8 by 8 by 32 inches (20 by 20 by 81 cm) projecting about 5 inches (13 cm) above ground and having bronze disk in top True bearings approximate center of large post in northwest corner of field, 88° 55′ 1, front left edge of tallest brick building west of railroad station, 242° 28′ 1, tip on water-tank, 263° 16′ 0, northwest corner of Rose Inn, 294° 39′ 7

Station *B* is 328 7 feet (100 19 meters) west of station *A* near middle of field, 55 0 feet (16 76 meters), and 116 5 feet (35 51 meters) respectively from north and south boundary fences, and 76 paces from west fence True bearings approximate center of large post in northwest corner of field, 96° 57′, tip on water-tank, 263° 15′ 3, west gable of Rose Inn, 281° 00′ 4

Cheltenham, Maryland, 1924—Observations were made on pier B_t of the Cheltenham Magnetic Observatory of the United States Coast and Geodetic Survey, this being the pier regularly used by instruments compared with Cheltenham standards for declination and horizontal intensity Inclination observations were made at station designated *EI′*, consisting of a non-magnetic framework erected around the pier upon which the standard earth-inductor is permanently mounted

Dalton, Georgia, 1925—Two stations were occupied Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1911, in city park north of court-house, 29 feet (8 8 meters) south of center of path running west from fountain, 21 6 feet (6 58 meters) east of oak tree on street line west of park, 41 8 feet (12 74 meters) north of sweet-gum tree, 35 2 feet (10 73 meters) southwest of maple tree, and 30 6 feet (9.33 meters) west of small oak tree, marked by granite post 6 by 6 by 24 inches (15 by 15 by 61 cm) with magnetic-station marker of United States Coast and Geodetic Survey set in top True bearings north meridian stone, 179° 59′ 8, southwest corner of graded school, 191° 05′ 2, southwest corner of Methodist church above pilaster, 292° 43′ 0, northeast corner of court-house on date stone, 324° 09′ 2

Station *B* is on grounds of Fort Hill school east of railway station, about one-half mile (0.8 km) east of station *A*, 166 1 feet (50 63 meters) west of northwest corner of main school building, 72 2 feet (22 01 meters) north of near edge of concrete walk leading up to front of building, 50 3 feet (15 33 meters) southeast and 41 8 feet (12 74 meters) northeast respectively from two large pine trees, marked by block of Georgia marble, 8 by 8 by 14 inches (20 by 20 by 36 cm) set flush with surface of ground, and lettered on top "C I W 1925" True bearings spire on Copeland Home, 65° 35′ 7, spire on county court-house, 87° 10′ 4, southeast edge at window level of bell-tower on Methodist church, 88° 36′ 3, spire on Baptist church, 101° 56′ 7, left edge of water-tower at top, 149° 34′ 3, left edge at ground of flagpole in front of school, about 100 feet (30 5 meters), 302° 42′ 6

Deering, Alaska, 1922—About three-fourths mile (1 2 km) west-northwest of Deering, on southern shore of Kotzebue Sound, 25 meters southwest from line along grass-covered ridge northwest from southeast

NORTH AMERICA

UNITED STATES—*continued*

Deering, Alaska, 1922—continued
corner of small shed for storing powder, called the "powder-house," measured at right angles from a point 35 meters from powder-house. True bearings: telephone-post, 20° 36′.2, double mountain, 20° 06′.9, southeast corner of powder-house, 43 meters, 275°.

Florence, South Carolina, 1925—The United States Coast and Geodetic Survey station of 1912, designated *A*, is about 1.5 miles (2.4 km.) northwest of center of city, and about 1,200 feet (0.4 km.) southwest of Darlington branch of the Atlantic Coast Line Railroad, on experiment farm of Clemson College. As this station was in a cultivated field used in a special seed test for cotton, a new station, *B*, was chosen 90 feet (27.4 meters) east of station marker on line toward Mr. Gregg's house in an uncultivated lane between two one-acre plots, 13.0 feet (3.96 meters) northwest of stake marking south corner of plot east of old station, 243.1 feet (74.10 meters) southeast of fence along roadway south of gin-house measured from a point about 400 feet (122 meters) southwest of bell-tower, or about 200 feet (61 meters) northeast of east end of laborer's cabin. True bearings: lightning-rod on south end of Mr. Gregg's house, one-fourth mile (0.4 km.) 271° 25′.3, court-house spire, 1.5 miles (2.4 km.) 317° 54′.4.

Greenport, Long Island, 1925—Special observations were made during the total solar eclipse of January 24, 1925, in an open field belonging to Mr. Tasker, about 1 mile (1.6 km.) northwest of Greenport, Long Island. Two temporary buildings were erected, one to house the magnetograph and potential-gradient electrograph, and the second was erected to shelter the electric instruments. Magnetic observations were made at a tent station between these two temporary buildings, 76 feet (23.2 meters) northwest of northwest corner of former and 102 feet (31.1 meters) southeast of southeast corner of latter building. True bearings: right edge at top of smoke-stack on power house, 11° 43′.3, southwest corner of atmospheric-electric observatory, 126° 48′.3, right edge of right chimney of Mr. Tasker's house, 172° 23′.8, flagpole on school, 327° 09′.3.

Jacksonville, Florida, 1925—Two stations were occupied. Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1920, near northeast corner of fair-grounds, on east slope of sandy hill, 41 feet (12.5 meters) south of north boundary fence, about 100 feet (30 meters) east of ruins of burned building nearly opposite east end of race-track, marked by rough gray granite stone, 6 by 8 by 26 inches (15 by 20 by 66 cm.) with small hole in top to mark center. True bearings: center of chimney at brewery (seen through grand-stand), 37° 51′.4, tip on distant water-tank, 1 mile (1.6 km.), 51° 40′.8, tip on church bell-tower, 1 mile (1.6 km.), 53° 14′.3, east edge of flagpole on fair-building, 600 feet (183 meters), 352° 54′.4, Weather Bureau tower on Graham Building, 353° 49′.4.

Station *B* is about 125 paces south of station *A* on line to flagpole on near end of fair-building, about 50 feet (15 meters) northeast of center of driveway, measured from point at curve of driveway and in line with extreme left corner post of grand-stand, 62.0 feet (18.89 meters) southeast, and 45.5 feet (13.9 meters) southwest respectively from two large pine trees. True bearings: extreme left corner post of grand-stand, 37° 13′.0, extreme right corner of post of grand-stand, 54° 41′.4, station *A*, 172° 53′.8, gable of house at southeast corner of street intersection, 285° 13′.2, flagpole on north tower at main entrance to fair-grounds, 343° 18′.1, flagpole on near end of fair-building, 352° 52′.7.

Miami, Florida, 1922—Two stations, *A* and *B*, were occupied. Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1915, in southeast section of Royal Palm Hotel Park, near intersection of 14th Street and boulevard along beach, 59.6 feet (18.17 meters) north of edge of walk along 14th Street, and 55.6 feet (16.95 meters) west of edge of walk along boulevard, marked by limestone post 7 by 7 by 18 inches (18 by 18 by 46 cm.) set flush with ground and lettered "U.S.C.&G.S. 1903." True bearings: lower center north wireless tower across Biscayne Sound, 243° 56′.4, Flagler monument, 248° 51′.6, tip of water-tower, 259° 28′.8, flagstaff on south tower of Hardie's casino, 274° 23′.2.

Station *B* bears 18° 21′.0 west of south from station *A* and is distant 176.6 feet (53.83 meters), 73.5 feet (22.40 meters) south of curb line on south side of 14th Street measured from a point 122 feet (37.2 meters) west of west edge of boulevard, marked by concrete coping block 8 by 8 by 24 inches (20 by 20 by 61 cm.) set flush and lettered "C. I. W. 1922." True bearings: staff on McAllister's Hotel, 179° 14′.4, lower center of north wireless tower across Biscayne Sound, 243° 36′.6, Flagler monument, 248° 12′.0, spike on water-tower, 258° 56′.9.

Mount Wilson, Ether Point, California, 1923—Observations were made on the easternmost pier of four concrete piers within a sheet-iron building on Ether Point on the grounds of the Mount Wilson Observatory. Before the eclipse observations of September 9, the height of the pier was increased by adding 12 inches (30.5 cm.) of concrete, making the height of the pier 3.5 feet (1.07 meters). The instrument was fastened to the top of this pier by means of plaster of Paris. True bearings: azimuth station, 0° 31′.7, south edge of center strut, 150-foot tower, 54° 01′.6. (This station was used for variation observations only, the absolute values being uncertain on account of the large amount of magnetic material present.)

Azimuth station is about 500 feet (152 meters) south of Ether Point.

Mount Wilson, California, 1926—Station designated *Magnetic Observatory Site* was occupied at site tentatively adopted for small variation observatory about 125 feet (38 meters) south of the 75-foot tower, about 30 yards (27 meters) north of the northeast corner of the Observatory laboratory. True bearings: San Antonio peak, 259° 12′.6, south point of roof of laboratory, 337° 49′.4, flagstaff, 348° 30′.0.

Point Loma, California, 1923—Three stations were occupied on the military reservation of Fort Rosecrans on Point Loma, on small plateau just south of the old Spanish lighthouse. Station *A* is about 150 feet (46 meters) southeast of old range-finding house and 125 feet (38 meters) northwest of old flagpole. True bearings: west edge of window on old Spanish lighthouse, 172° 47′.8, spire on lighthouse, 173° 14′.0, tower, Naval Air Station, North Island, 224° 40′.8, south tower, Coronado Hotel, 259° 36′.8.

Station *B*, at which absolute inclination observations were made, is 3 feet (0.9 meter) southeast of station *A*, and was used as the inclination station during eclipse observations.

Station *C* is 97 feet (29.6 meters) southeast of sta-

NORTH AMERICA

UNITED STATES—*continued*

Point Loma, California, 1923—continued tion *A* and was used to determine variations in horizontal intensity during eclipse observations in conjunction with declination observations at station *A* No absolute observations were made at station *C*

San Francisco (Fort Scott), California, 1921—Two stations were occupied in the military reservation of Fort Scott Station *A* is in vacant plot of ground north of parade-ground, about 415 feet (126 meters) south of large barracks building, marked by a pine stake True bearings base of flagpole in front of Fort Scott Headquarters, 7° 04′ 7, light on Point Stewart, west end of Angel Island, 201° 20′ 1, lighthouse on Alcatraz Island, 242° 30′ 0, campanile at University, 248° 31′ 6

Station *B* is 86 8 feet (26 45 meters) northeast of station *A* on line toward lighthouse on Alcatraz Island, in line with northwest side of fourth house facing beach road and about 800 feet (244 meters) distant, and nearly in line with west side of lower large barracks, marked by hole in top of a granite post 6 by 6 by 18 inches (15 by 15 by 46 cm), with letters "C I W 1921" cut in top surface True bearings base of flagpole in front of Fort Scott Headquarters, 9° 27′ 0, lighthouse on Lime Point, 169° 38′ 5, light on Point Stewart, west end of Angel Island, 201° 11′ 6, lighthouse on Alcatraz Island, 242° 30′ 0

San Rafael, California, 1921—Exact reoccupation of United States Coast and Geodetic Survey station of 1897 and C I W station of 1905, 1908, and 1916, 1 1 miles (1 8 km) west-northwest of county court-house, on eastern slope of hill about 375 feet (114 meters) east of water company's reservoir, marked by marble post 8 by 8 by 48 inches (20 by 20 by 122 cm), projecting about 24 inches (61 cm) above surface of ground, and lettered "U S C and G S" on its west vertical face, "MAG STA" on its south face, and "1897" on its east face, with a cross on upper face marking exact point True bearings meteorological station on Mount Tamalpais, 26° 58′ 4, flagpole on county court-house, 289° 46′ 3

Sweetwater, Texas, 1924—Two stations were occupied Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1910, in southeastern part of city, near southeast corner of property of Sweetwater Mineral Springs Company, 89 6 feet (27.31 meters) from east fence, 80 6 feet (24.57 meters) from south fence, 97 5 feet (29 72 meters) directly back (southeast) of cottage used as hospital in front of which is the Mineral Springs Company's water-tank, marked by brass screw in center of concrete post set flush with ground True bearings city stand-pipe, 1 mile (1 6 km) 72° 28′ 9, flagstaff seen over left slope of hospital roof, one-half mile (0.8 km), 129° 13′ 5, short flagstaff seen near right slope of hospital roof, 131° 44′ 3, right of two ornaments on residence, one-half mile, (0 8 km), 147° 38′ 3

Station *B* is about 1 mile (1 6 km) due west of *A*, west of city, on open land just north of 90-meter square reservation on which stand-pipe for city water is located It is 435 feet (133 meters) north of base of stand-pipe, 102 5 feet (31.24 meters) east of center of road along west side of plot, and 599 7 feet (182 79 meters) from northwest corner of small Mexican church in direct line with north end of this church extended to west, marked by cross cut in rough stone set flush with ground True bearings low steeple on residence, 1 mile (1 6 km), 222° 40′ 3, flagstaff at southeast corner of court-house, 1 mile (1 6 km) 229° 23′ 2, tip of oil-tank at Texas and Pacific Railroad, one-half mile (0 8 km), 233° 43′ 9, cross at north end of Mexican church, 257° 10′ 5

Tucson, Arizona, 1924—Three stations designated *Magnetometer Pier, Inductor Pier,* and *B* were occupied for intercomparisons at the Tucson Magnetic Observatory of the United States Coast and Geodetic Survey The two piers are in the absolute house and station *B* is outside, about 40 feet (12.2 meters) from *Magnetometer Pier* in direct line with the observatory azimuth mark

Washington, Rock Creek Park, 1921—In northern part of the District of Columbia in large open field in Rock Creek Park, south of residence of Rudolph Kauffmann on Military Road N W , about one-half mile (0 8 km) east of office of Department of Terrestrial Magnetism, about 105 paces south of boundary stone on south side of Military Road and about 36 paces east of largest of pine trees in northeast corner of group in hollow True bearings Cathedral tower, 22° 30′ 3, east edge of east chimney on distant house, 38° 52′ 9, south gable of Kauffman stable, 171° 24′ 5, iron lamp-post at northeast intersection of Daniel Road and Military Road, 227° 45′ 3

Washington, S M O, 1921-1926—Observations made in connection with standardizing of magnetic instruments at Washington were made in the Standardizing Magnetic Observatory (description of this building will be found in Volume II of this series, pages 199-200) Observations for horizontal intensity were in general made both with instrument compared and standard instrument, each on its own tripod at stations designated N_m and S_m, although on a few occasions brick pier in east bay of building designated E_m was used For inclination, piers N_e and S_e were used, with an occasional substitution of E_m In all cases there was an exchange of stations to eliminate station difference and observations with instrument compared and standard were as nearly simultaneous as different type of instruments used would permit As reference mark for declination, a collimator was erected near north boundary of grounds of Department

Waycross, Georgia, 1922, 1925—Two stations were occupied Station *A* is United States Coast and Geodetic Survey station of 1908 and 1917 which was exactly reoccupied in 1922 and closely reoccupied in 1925, marking stone having been plowed out the previous year, it is on grounds of Piedmont Institute about 1 mile (1 6 km) northeast of center of town, 191 feet (58.2 meters) northeast of northeast corner of main college building, 50 6 feet (15 42 meters), and 79 1 feet (24 11 meters) from south and east corners respectively of east frame dormitory, 128 6 feet (39 20 meters) west of small live-oak tree in east corner of grounds, marked by cement post about 24 inches (61 cm) long set flush and lettered on top "C I W 1925" with fragment of original marble slab 2 by 6 inches (5 by 15 cm) with letters "U S" on top and "1908" on one side set in top projecting about 2 inches (5 cm) above cement True bearings. upper-left edge of water-tower, 59° 07′ 5, court-house spire, 72° 20′ 9, east edge of main college building, 73° 48′ 9, northwest edge of main college building, 104° 24′ 0, southeast edge of frame building at top of brick foundation, 50 feet (15 2 meters), 128° 12′ 1, right edge of chimney at roof, white house opposite southeast corner of campus, 22° 55′ 7

NORTH AMERICA

UNITED STATES—*concluded*

Waycross, Georgia, 1922, 1925—continued
Station *B* is 312 5 feet (95.25 meters) southwest of station *A,* 70 4 feet (21 46 meters) north of small live-oak tree on direct line from tree to south corner of arched doorway at southeast end of main college building, 143 1 feet (43 62 meters) south of south corner of main building, and 124 3 feet (37 89 meters) northwest of fence on opposite side of Scruggs Street, marked by pitch-pine post 6 inches (15 cm) in diameter with brass screw in top, set 2 feet (61 cm) below surface True bearings center of live-oak tree, 5° 58′, left edge of water-tower, 59° 58′ 5, left edge main college building, 156° 36′ 4, right edge main college building, 191° 20′ 4, station *A,* 227° 09′ 3, west corner of house across Scruggs Street, 352° 54′ 4

Whiteville, North Carolina, 1925—Two stations were occupied Station *A* is an exact reoccupation of United States Coast and Geodetic Survey station of 1898, near southeast corner of court-house grounds, 33 feet (10 1 meters) southwest of southwest corner of hotel, 4 feet (1.2 meters) north of north edge of cement sidewalk, and 10 feet (3 0 meters) northeast of anchor-pin for telephone-pole, marked by stone lettered "N C G S, U S C S 1898," projecting about 3 inches (8 cm) above ground True bearings east edge at roof ridge of cupola of Baptist church, 4° 01′ 0, northeast corner of frame building seen behind Oscar High building, 106° 21′ 0, northeast corner of Oscar High building, 119° 03′ 2, north meridian stone, 179° 59′ 7, northwest corner of Powell residence, 337° 42′ 7

Station *B* is on open lot about one block south of station *A* nearly in line with east edge of cupola on Baptist church, about 34 paces east of sidewalk along street to court-house, 16 5 feet (5 0 meters) south of ditch along south side of street, 30 feet (9 1 meters) southeast and 23 feet (7 0 meters) southwest respectively from two large trees in row bordering street, and 47 6 feet (14 51 meters) south of center of man-hole cover in middle of street True bearings east edge at roof ridge of cupola of Baptist church, 4° 01′ 2, station *A,* 184° 01′ 9, east edge of chimney on bungalow, 600 feet, (183 meters), 345° 50′ 2

SOUTH AMERICA

ARGENTINA

Bahia Blanca, Buenos Aires, 1925—Two stations were occupied Station *A* is a practical reoccupation of C I W station of 1919, in field about 10 kilometers south of Bahia Blanca and about 1 kilometer northwest of the port of Engineer White, in west extension of street passing two squares north of railroad station, about 300 meters west of nearest building in town, about 150 meters southeast of shack (erected about 1923), 66 0 meters north of crooked wooden fence-post, and 151 meters west of north-south wire-fence, marked by peg True bearings spike on railroad signal-tower, one-half mile (0 8 km), 17° 20′ 0, left side chimney near grain elevator, 1 mile (1 6 km), 69° 02′ 8, cathedral spire in Bahia Blanca, 182° 18′ 2, tower of municipal building in Bahia Blanca, 187° 32′ 8, left side of chimney near grain elevator at railroad station, 1 mile (1 6 km), 330° 20′ 2

Station *B* is about 200 meters west-northwest from *A,* 87 0 meters north of wire fence, and 38 0 meters west of wire fence leading to shack, marked by peg True bearings left edge of chimney near elevator, 65° 52′ 2, cathedral spire in Bahia Blanca, 183° 03′ 3, tower of municipal building in Bahia Blanca, 188° 21′ 8, left edge of chimney near grain elevator at railroad station, 329° 59′ 4

Colonia Las Heras, Santa Cruz, 1925—Close reoccupation of C.I W station of 1919, east of town and southwest of locomotive shed, about 250 meters south of water-tank at railroad track, in open field 30 5 meters east of wire fence, marked by peg True bearings left side of small chimney, one-half mile (0 8 km), 48° 39′ 5, spike on water-tank, 176° 59′ 9, top of railroad signal, 300 meters, 231° 03′ 5

Corrientes, Corrientes, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1913, southeast of main town in San Martin Park, 197 feet (60 0 meters) east of wire fence bordering Santa Fe Street, 301 feet (91 7 meters) south of small wooden house with peaked roof, and southwest of football-field, marked by peg True bearings right edge of cement house, about 400 meters, 106° 47′ 0, center church spire of three, 3 miles (4 8 km), 180° 51′ 9, gable of Aero Club hangar, 600 meters, 310° 15′ 7

Station *B* is nearly due north of *A,* 153 feet (46 6 meters) east of wire fence bordering east side of Santa Fe Street, 120 feet (36 6 meters) northeast of small wooden house with peaked roof, and 12 meters west of west side-line of football-field, marked by peg True bearings right edge of cement house, 69° 17′ 8, center church spire of three, 180° 57′ 8, gable of Aero Club hangar, 326° 34′ 8

Florida, B, Buenos Aires, 1923—Close reoccupation of C I W station *B* of 1920, in southeastern part of vacant block bounded on north by Calle Llavallol, on east by Calle Coronel Rossetti, on south by Calle Urquiza, and on west by Calle Blas Perera, 107 3 feet (32 70 meters) west of concrete fence base at east side of inclosure, and 104 5 feet (31 85 meters) north of fence base at south side, marked by large green-glass bottle buried inverted, the center of bottom marking exact spot True bearings minaret on nearest flagstaff on house, 9° 41′ 6, spire of Mr Wiggin's former residence, 78° 03′ 1, ventilator on house, 184° 16′ 1, spire of church, 257° 44′ 3

La Quiaca, Jujuy, 1923, 1926—In 1923 the station of 1917 was closely reoccupied, and comparison observations were made on *Magnetometer Pier* in the absolute house of the observatory, with an auxiliary station, *B,* outside in line with azimuth mark In 1926 observations were made on *Magnetometer Pier* and station *C* near eastern boundary of observatory grounds

Station *1917* is about 100 meters south of Meteorological Observatory in line with extreme west wall of observatory kitchen, about 120 meters northeast by east from absolute observatory, and 0 8 meter south of south side-line of street leading east into town True bearings extreme right edge of observatory building, 189° 31′ 6, ornament at left end of roof of railway storehouse, 287° 00′ 3, left knob at entrance to cemetery, 358° 52′ 8

Magnetometer Pier is most easterly pier in non-magnetic absolute building of Meteorological Observatory and used for absolute declination and horizontal intensity observations Station *B* occu-

SOUTH AMERICA

ARGENTINA—*continued*

La Quiaca, Jujuy, 1923, 1926—continued pied in 1923 is 60 meters east of base of magnetometer pier on line toward an azimuth mark in azimuth 276° 33′ Station *C* used in 1926 is in line from pier toward center upright of windmill in plaza, 39 meters west of wire fence, and 43 meters north of an east-west fence True bearing Center upright of windmill on plaza, one kilometer, 268° 53′.2

Mendoza, Mendoza, 1926—Two stations were occupied, near Argentine Meteorological Office station of 1914, and C I W station of 1917, in Parque San Martin (also known as Parque del Oeste) Station *A* is 65 meters east of drive on which *confiteria* faces, 41 meters southwest of second drive and 87 meters north-northwest of third drive which encircles La Rotunda, marked by peg True bearings letter "Y" over door of *confiteria,* 77° 58′ 8, ornament on band-stand, 309° 40′ 3

Station *B* is 33 meters southwest of *A,* on line with south side of and 80 meters east of southeast corner of *confiteria,* marked by peg True bearings left edge of wooden pavilion, 95° 36′ 8, ornament on band-stand, 300° 29′ 8

Mercedes, Buenos Aires, 1925—Two stations were occupied Station *A* is a practical reoccupation of C I W station of 1919, in quinta belonging to Señor Bernardo Rocca, about 600 meters southwest of barracks and about 200 meters west of two small brick houses, 92 meters east of north-south fence, and 103 meters north of east-west fence outside a row of small trees, marked by peg True bearings brick chimney, 2 miles (3 2 km), 206° 15′ 8, cathedral spire, 1 8 miles (2 9 km), 212° 12′ 0, water-tank at barracks, 1 mile (1 6 km), 241° 59′ 6, flagpole on large house, 342° 04′ 4

Station *B* is about 200 meters from *A* on bearing 169° 04′ 9, 11 0 meters east of north-south fence on property of Señor B Rocca, marked by peg True bearings cathedral spire 214° 26′ 3, water-tank at barracks, 250° 52′ 8; flagpole on house, 344° 02′ 0

Monte Caseros, Corrientes, 1925—Practical reoccupation of C.I W station of 1913, within football-field on municipal property on open bank of river, east of town, in line with west side of Uruguay Street, 186 paces west of edge of river, 177 paces south of corner of fence which incloses last house on west side of Uruguay Street, and 6 0 feet (1 8 meters) south of north side-line of football-field, marked by peg True bearings church spire in Monte Caseros, 1 mile (1 6 km), 145° 20′ 0, right edge of red brick house, 0 2 mile (0 3 km), 194° 24′ 5, left spire of church in Santa Rosa, Uruguay, 3 miles (4 8 km), 283° 27′ 0

Pilar, Cordoba, 1923, 1926—Intercomparison observations were made on grounds of Pilar Observatory of Argentine Meteorological Office Station *B* is practically an exact reoccupation of C I W stations of 1911 and 1917, the small frame building having been renovated and the pier reset recently Station *D* is the regular absolute observatory in which declination and horizontal intensity were observed at *Pier 5,* and inclination at *Pier 2* The observatory azimuth mark at corner of tennis-court bears 94° 36′ 1 from *Pier 5* of station *D,* and 100° 13′ 1 from station *B*

Puerto Deseado, Santa Cruz, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1919, in open pampa just outside and east of town, about 600 meters northeast of railroad station, about 400 meters northwest of large freezer (built since 1919), and 124 paces northwest of wire fence inclosing field near railroad, marked by center of top of rough native stone projecting 10 centimeters True bearings left side of elevated tank at railroad, 150 meters, 9° 14′.3, left corner of railroad station, 33° 45′ 9, beacon-light, 36° 15′ 2, center of large chimney, 600 meters, 74° 50′ 6, Penguin Island Lighthouse, 5 miles (8 km), 326° 13′ 1

Station *B* is northwest of *A* about 7 paces southwest of line to Penguin Island Lighthouse and on extension eastward of center line of road into town, marked by an irregular native stone True bearings left side of elevated tank at railroad, 180 meters, 5° 19′ 2, left side of large chimney of freezer, 307° 22′.2, Penguin Island Lighthouse, 326° 10′ 4

SOUTH AMERICA

ARGENTINA—*concluded*

Puerto Madryn, Chubut, 1925—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1919, northwest of main part of town, on crest of small rise south of shallow valley 300 meters wide and across valley from cemetery, west of house formerly used as Argentine meteorological station, and 145 paces northwest of and in line with small brick house and spire of bath-house on beach, marked by a bone driven like a peg flush with ground True bearings beacon-light, 4 miles (6 4 km), 192° 51′ 6, point of land, 6 miles (9 7 km), 294° 01′ 2, spire on large house, 1 mile (1 6 km), 350° 40′ 8

Station *B* is 70 paces nearly due west of *A*, marked by a bone driven like a peg flush with ground True bearings beacon-light, 4 miles (6 4 km), 193° 36′ 3, top of water-tank, 1¼ miles (2 0 km), 324° 45′ 4, spire on large house, 1 mile (1 6 km), 345° 43′ 3

Rio Grande, Tierra del Fuego, 1925—About 1 mile (1 6 km) northwest of the large meat freezer at Rio Grande and about 450 meters southwest of Menendez Company's pier It is 97 5 feet (29 72 meters) south of a wooden telegraph-pole and practically in line with side of custom-house (policia maritima), marked by peg True bearings wireless mast, 1 mile (1 6 km), 158° 51′ 1, flagpole on custom-house, 400 meters, 229° 00′ 6, right edge of chimney at freezer, 306° 11′ 3

Santa Cruz, Santa Cruz, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1919, in small open field forming main plaza of town, about 400 meters southwest of church, 46 3 meters southwest of near corner of base of monument, 33 meters from fence bounding southwest, and 48 meters from fence bounding southeast side of field, marked by wooden stake. True bearings right edge of small chimney pipe, 300 meters, 164° 23′ 5, church cross, 225° 17′ 9, cross on monument in cemetery, 0 8 kilometer, 356° 24′ 1

Station *B* is about 400 meters southwest of *A,* west of dirt road which is main track to pampa, 159 feet (48 46 meters) west of southwest corner of small shack, and 225 feet (68.58 meters) southwest of southwest corner of small house, marked by peg True bearings near gable of house, 400 meters, 189° 17′ 6, church cross, 500 meters, 255° 11′ 3, cross on monument in cemetery, 2 4 kilometers, 346° 40′ 8

Tucumán, Tucumán, 1923—Close reoccupation of C I W station of 1917, on grounds of "Escuela Agricultura Federal," about 75 meters southeast of house formerly used by superintendent, 78 meters north of second fence-post of gate in south fence, and in line with right edge of this fence-post and right edge of nearby white house to south, 42 4 meters south of southern row of big trees, and 11 4 meters east of line of row of small trees along east side of road

SOUTH AMERICA

BOLIVIA

Guayaramerin, Beni, 1924—At turn of road in front of house occupied by Dr Lima, Brazilian consul, near northeast corner of pasture used for football field, 19 1 feet (5 82 meters) from fence corner, 22 3 feet (6 80 meters) from nearer gate-post, and about 12 feet (4 meters) from road, marked by granite rock set nearly flush with ground, lettered "C I", a cross marking point True bearing point on Madeira-Mamore water-tank, across river, 185° 01′ 2

La Paz, La Paz, 1923, 1924—Two stations designated *A* and *B* were occupied in 1923, and station *A* was reoccupied in 1924 Station *A* is an exact reoccupation of C I W station of 1917, about 6 kilometers west from central part of La Paz at Alto de La Paz, located on level pampa 1,400 feet (427 meters) above the city. It is one-half mile (0 8 km) southeast of Guaqui and La Paz railway station and near western end of golf-course, 35 meters east of curved dirt bunker and about 5 meters north of axis of its eastern end extended, marked by cross in rough native stone set nearly flush with the ground True bearings right-hand wireless tower of Viacha, 43° 32′ 1, extreme right edge of Guaqui and La Paz railway station, 157° 27′ 1, right edge of stone depot 220° 10′ 3, central of three highest peaks of Illimani, 40 miles (64 km), 290° 59′ 3, tip of Murillo Monument, three-fourths mile (1 2 km), 296° 13′ 7

Station *B* is about one-fourth kilometer south of *A*, on opposite side of golf-course fairway, about 1 meter north of axis of second dirt bunker, 33 5 meters from its west end, and 20 paces from edge of roadway to southwest, marked by cross cut in naturally embedded rock projecting slightly above ground, with letters "C I" cut roughly in rock near cross True bearings right-hand wireless tower of Viacha, 43° 11′ 0, right edge of stone railway station, 218° 44′.5, tip of Murillo Monument, 282° 30′ 4, central one of three highest peaks of Illimani, 290° 39′.8.

Uyuni, Potosi, 1923—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1917, about one-half kilometer northwest of plaza, within triangle formed by intersection of three roads or trails, 24 5 feet (7 5 meters) from edge of road to northeast, 56 feet (17 1 meters) from edge of road to south, 43 5 feet (13 3 meters) from edge of road to west, and 34.4 feet (10 5 meters) north of line extended of row of poles through center of main east-west street of town, marked by deep cross cut in top of limestone rock projecting about 1 inch (3 cm) above ground True bearings point on distant mountain range between two more rounded ones, 128° 53′ 8, sharp point on mountain range, 210° 46′ 7, central point or tip of church tower, 295° 36′.3, south side of chimney at railway shops, 295° 52′ 9, base of flagstaff on tower of post-office building, 309° 12′ 3

Station *B* is 152.8 feet (46.57 meters) northwest of station *A* in direct line from flagstaff on tower of post-office building through station *A*, 57 feet (17 4 meters) from road to northeast, 124 feet (37 8 meters) south of inner point of division of road into two slightly diverging roads, and 24 0 feet (7 32 meters) north of line extended of row of poles through center of main street of town, marked by deep cross cut in top of soft limestone rock set flush with surface of ground True bearings point on mountain range between two more rounded ones, 128° 53′ 8, sharp point on mountain range, 210° 54′ 9, central tip of church tower, 296° 47′ 7, base of flagstaff on post-office building and station *A*, 309° 12′.3

SOUTH AMERICA

BRAZIL

Alcobaça, Para, 1923—About 100 feet (30 meters) south of probable location of C I W station of 1915, on railroad property, west of Tocantins River, about 80 yards (73 meters) west of two houses on ridge just back of terminal of railroad yards along river bank, 260 feet (79.2 meters) west of a line from northeast corner of house belonging to Martius Carvalho (formerly owned by Jose Monteira) to southwest corner of next house north, measured from a point 90 feet (27 4 meters) north of first house toward large prominent tree on hill to westward, marked by rough stone 22 inches (56 cm) long, projecting 2 inches (5 cm) above surface, and lettered "C I," a cross marking exact point True bearings large lone sumahuma tree, 206° 16′.2, porch post at southeast corner of house, 246° 19′ 6, left-hand edge of northeast corner of Martius Carvalho's house, 285° 44′ 0, tree one-half mile (0 8 km) distant just above large limb lower down than the rest on right side of trunk, 330° 58′ 4

Almeirim, Para, 1923—Close reoccupation of C.I.W station of 1918 On left bank of Amazon River, in village of Almeirim, between church and jail and in front of intendencia, 39 4 meters southeast of southeast corner of small wing of church, 47.0 meters northwest of north corner of jail, and 39 6 meters northeast of west cement post at top of old concrete incline to pier, marked by stone about 8 by 10 inches (20 by 25 cm) on top, lettered "C I W." with point marked by cross. True bearings southeast corner of intendencia building, 63° 32′.7; point on west gate-post, 319° 17′ 4

Alta Mira, Para, 1923—Near south end of street facing river, on top of bank, 79 2 feet (24 14 meters) northeast of northeast corner of public cemetery wall, 61 1 feet (18.62 meters) southeast of southeast corner of last house on street, and 12 feet (3 7 meters) south of path leading to river, marked by circular concrete block about 16 inches (41 cm) in diameter, extending at center about 4 inches (10 cm.) above ground lettered "C I. 1923," a brass cartridge shell set flush with concrete marking exact point True bearings left edge of middle window of most easterly house across Xingu River, 251° 43′.2

Aracaju, Sergipe, 1923—On Santo Antonio hill, on land belonging to city, 58 0 feet (17 68 meters) and 67 1 feet (20 45 meters) from northeast and northwest corners respectively of small chapel standing on brow of hill, 89.0 feet (27 13 meters) east of southeast corner of new residence, and 30 3 feet (9 24 meters) southeast of concrete base of rain-gage support, marked by large rough stone 22 inches (56 cm) long, set flush with surface of ground, and lettered "C I 1923," a cross near center marking exact spot True bearings single spire of large church, 326° 00′ 4, left spire of church, 335° 28′ 0, right spire of same church, 335° 39′ 7, left dome of old church, 337° 38′ 4, right dome of same church, 337° 43′ 4

Bahia, Bahia, 1923—Two stations were occupied Station *A* is on grounds of meteorological station, about 3 kilometers south of city, on way to suburb called Rio Vermelho, in roadway between experimental plots of land east of buildings, 60 7 feet (18.50 meters) east of northeast corner of building called "living quarters," marked by rough stone buried 2 inches (5 cm) below surface, with notch in upper sharp edge True bearings tip of tower of large house, 150° 35′ 0, tip of dome of São Bento Church

SOUTH AMERICA

BRAZIL—*continued*

Bahia, Bahia, 1923—continued
in Bahia, 161° 31′ 7, main cross on cathedral in Bahia, 171° 16′ 9
Station *B* is about 125 yards (114 meters) west-southwest of station *A*, near southwest corner of grounds of meteorological station, in driveway passing along west side of residence building, 94 7 feet (28 86 meters) south of southwest corner of same building, 45 6 feet (13 90 meters) north of east gate-post at end of driveway, and 11 4 feet (3 47 meters) northeast of eucalyptus tree, marked by rough stone buried 5 inches (13 cm) below surface of roadway, a chiseled notch in upper sharp edge marking exact spot True bearings cross at south end of Eglesia São Lazeru, 72° 14′ 7, cross at north end of Eglesia São Lazeru, 73° 37′ 5, flagstaff on living quarters, 249° 03′ 1

Barcellos, Amazonas, 1924—Two stations were occupied Station *A* is close reoccupation of C I W station of 1913, in village of Barcellos, on right bank of Rio Negro, northeast of and across road from large building marked "IMB 1918," 129 feet (39 3 meters) northwest of west end of bridge across most westerly creek, 53 5 feet (16 30 meters) northeast of large almond tree, and 25 5 feet (7 77 meters) south of edge of river bank, marked by concrete block 8 by 8 inches (20 by 20 cm) on top, lettered "CIW 1924," exact point marked by brass cartridge shell set in concrete, and extending about 1 inch (3 cm) above ground True bearings northwest corner of building marked "IMB 1918," 72° 18′ 3, south edge of door-frame of house farthest east, 299° 45′ 2
Station *B* is on a small knoll about 200 feet (61 meters) northwest of station *A*, about 25 feet (8 meters) south of river bank, 47 6 feet (14 51 meters) northeast of corner of house occupied by Intendente, and 57 2 feet (17 43 meters) east of lamp-post in front of house, marked by large rough chunk of granite set flush with ground, faced up square with concrete, exact point being marked by a brass cartridge shell flush with concrete True bearing south edge of door-frame of most southerly house in town, 300° 37′ 6

Bella Vista, Goyaz, 1925—Close reoccupation of C I W station of 1915, near center of town square, 65 9 meters southwest of middle of door of church Senhora da Piedade, 64 8 meters northeast of northwest corner of house of Vincente Bonifacio, and 52 7 meters north of northeast corner of jail, marked by peg True bearings left edge of jail, 3° 58′ 9, right edge of house of Vincente Bonifacio, 52° 09′ 4, right edge of church of Senhora da Piedade, 214° 48′ 1

Bocca do Jutahy, Amazonas, 1924—Observations were secured in village of Jutahy, half mile (0 8 km) east of mouth of Jutahy River, at a point across street from post-office, on bank of Amazon River and on westward side of small stream crossed by bridge True bearing gable of house 239° 17′ 6

Cachoeira (Tucuruhy), Para, 1923—In open place in brush, 60 feet (18 3 meters) southeast of building, marked by tent-peg

Capivara Cachoeira, Para, 1923—On west bank of Rio Fresco, about 300 feet (91 meters) above head of Capivara Cachoeira or rapids, on large flat sand-bank which is submerged during winter months, about 15 feet (5 meters) from edge of water on upper end of sand-bank

Caravellas, Bahia, 1923—Two stations were occupied Station *A* is an exact reoccupation of Brazilian Magnetic Commission station of 1904, near south side of large open level field formerly called "Campo Grande," about 300 feet (91 meters) from river bank 122 0 feet (37 19 meters) west of bread-fruit tree, 114 0 feet (34 75 meters) northwest of double tree, 190 6 feet (58 09 meters) northeast of large mango tree in a fence-line, and 166 paces from center of narrow-gage railway connecting Caravellas with Ponte de Areia, marked by pier erected by Brazilian Magnetic Commission, exact point being cross chiseled in copper plate on pier just before letter "M" in "Meteorologia" True bearings left ornament of two on roof of building at wharf, 118° 57′ 8, right ornament of two on building seen just over right slope of dwelling, 136° 46′ 1, ornament at east end of roof of dwelling-house, 160° 20′ 8
Station *B* is near north side of campo, 319 paces northeast of station *A*, 190 4 feet (58 03 meters) southwest of concrete curbing of large shallow well, and 340 feet (103 6 meters) west of another well housed over, marked by hardwood post 5 inches (13 cm) in diameter, 3 feet (0 9 meter) long, set flush with surface, brass screw near center marking exact spot True bearings station *A*, 22° 02′ 3, ornament on roof over three gable windows at east end of roof of large dwelling house, 83° 25′ 8, spire of Catholic church, 102° 02 ′3, ornament on east gable of roof of house at west side of campo, 107° 50′ 9

Catalão, Goyaz, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1915, about one-half kilometer southeast of railroad station, and 62 3 feet (18 99 meters) west of southeast corner of Meteorological Observatory inclosure, marked by cross in rough stone True bearings center cross of three on hill, one-half kilometer, 36° 17′ 9, large cross in cemetery, 2 kilometers, 127° 25′ 9, cross on chapel of St John, 4 kilometers, 184° 31′ 0
Station *B* is 144 2 feet (43 95 meters) southwest of *A*, marked by cross in rough stone True bearings center cross of three on hill, 37° 31′ 3, cross on chapel of St John, 185° 00′ 0, weather vane in Meteorological Observatory inclosure, 213° 28′ 8

Colonia Corazon Jesus, Matto Grosso, 1925—On Cuyaba-Goyaz trail at a colony conducted by Catholic priests for Bororo Indians, in center of main yard of colony, 50 4 meters southwest of the southeast corner of large building used by priests, 20 1 meters west of a large wooden cross, and 30 8 meters east of Indian hut, marked by peg True bearings point on rock on hillside, one-fourth mile (0 4 km), 19° 22′ 4, cross on hillside, 1 mile (1 6 km), 133° 13′ 6, southeast corner of building used by priests, 216° 56′ 2

Corumba, Matto Grosso, 1925—Two stations were occupied Station *D* is a close reoccupation of C I W station *A* of 1913 and 1914, about 25 meters north of north bank of Paraguay River opposite town about 250 yards (229 meters) west of a sunken iron barge, on land submerged at very high water, 79 9 feet (24 35 meters) south of a tree stump, marked by peg True bearings center of letter "I" over doorway of electric-light plant, one-fourth mile (0 4 km), 3° 12′ 6, right edge of black smoke-stack of brewery, one-half mile (0 8 km) 41° 33′ 0, church spire, one-third mile (0 5 km), 311° 53′ 5
Station *E* is 143 feet (43 6 meters) north of *A* and 63 0 feet (19.20 meters) north of tree stump used in locating *A*, marked by peg True bearings center

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BRAZIL—*continued*

Corumba, Matto Grosso, 1925—continued of letter "I" over doorway of electric-light plant, 5° 04'.6, right edge of black smoke-stack at brewery, 40° 31'.3

Curumuri, Para, 1923—In village at west end of trail from Alta Paru to Alta Jary rivers, about 3 miles (5 km.) up Curumuri Creek from Paru River, about one-half mile (0.8 km.) north up trail from boat landing, and about 400 feet (122 meters) south of chief's hut at edge of forest.

Cuyaba, Matto Grosso, 1925—Three stations, designated *A, B,* and *C,* were occupied. Station *A* is an exact reoccupation of the Brazilian Meteorological Service magnetic station of 1904, on grounds of the Salesiana College, under and on the west side of a large mango tree, marked by a copper plate on a brick pillar 3.4 feet (1.04 meters) high and 0.91 feet (0.28 meter) square. The copper plate bears the inscription:

Directoria de Meteorologia I^d, Com. Mag.
D = 0° 31′ 24″ NE I = 0° 6786 H = 0.2717
Lt = 15° 35′ 49″ S Lg = 56° 05′ 52″ W.G.
A. Silvado e C. Castro, 1904-1905

Auxiliary astronomical station is 15 feet (4.6 meters) southeast of this pillar. True bearings from pillar: left edge of white house, one-half mile (0.8 km.), 96° 40'.5, auxiliary station and point on east wall of college grounds, 335° 01'.4.

Station *B* is about 250 meters south and slightly east of *A,* 29.2 meters west of east stone wall of grounds, 27.9 meters north of south stone wall of grounds, and 7.0 meters east of small tree, marked by peg. True bearings: point on south wall, 34° 52'.6, weather-vane on observatory, 212° 31'.8.

Station *C* is at the northern extremity of the city on a large flat open square, 221.0 meters southwest of the southwest corner of a dwelling-house, and 198.0 meters northwest of northwest corner of stone house, marked by peg. True bearings: telephone-pole, 164° 51'.2, right edge of dwelling-house, 227° 44'.3, right edge of stone house, 330° 33'.3.

Estreeto, Para, 1923—On small farm located on left river bank, 26 feet (7.9 meters) from northeast corner and 21 feet (6.4 meters) from northwest corner of storehouse, the most northerly farm building, marked by large granite block about 12 by 12 inches (30 by 30 cm.) on top, projecting 2 inches (5 cm.) above ground and lettered "C.I.," a cross marking exact point.

Goyaz, Goyaz, 1925—Two stations were occupied. Station *A* is a close reoccupation of C.I.W. station of 1915, in Fountain Square, 31.5 meters southwest of northwest corner of public fountain, and 12 meters west of path running through the square, marked by peg. True bearings: left corner of police station, 1° 52'.5, cross in front of Santa Barbara Church, 149° 33'.4, left edge of public fountain, 231° 21'.5.

Station *B* is about 1 kilometer northwest of station *A* on northern outskirts of town at foot of Santa Barbara hill, on west side of Rua Cementario or Passo do Patrio, northeast of cemetery, and 34.3 meters northwest of pole No. 22 of the Goyaz-São Paulo telegraph-line, marked by peg. True bearings: cross in front of Santa Barbara Church, 70 meters, 126° 18'.3, left edge of police station, 1 kilometer, 332° 16'.1, left side of distant white house, 2 kilometers, 358° 28'.4.

Guayara Mirim, Matto Grosso, 1924—In open plaza two blocks south of Hotel Dondon, south of and on same street as house occupied by engineers of railway company, at a point 20 feet (6.1 meters) east of path, 107.7 feet (32.82 meters) from corner of paling fence, and 166.1 feet (50.63 meters) south of southeast corner of telegraph office, marked by cement block 8 by 8 inches (20 by 20 cm.) on top, lettered "CI 1924," exact point being marked by brass cartridge shell set flush with concrete. True bearing: point on water-tower, 23° 02'.1.

Jatoba, Para, 1923—At small cassava plantation on east bank of Xingu River immediately above Jatoba Rapids, 12 feet (3.7 meters) to left of path leading from landing to house, 73 feet (22.2 meters) west of nearest corner of house, and 54 feet (16.5 meters) southwest of large palm tree in direct line to corner of shed under which farinha is made, marked by granite stone about 12 by 12 inches (30 by 30 cm.) on top, set flush with ground, lettered "C.I.," exact center indicated by cross.

Jawaré Pootoolé Island, Para, 1923—On first large island below mouth of Pootinga River, on sand beach at extreme up-stream end of island.

Jawaré, Para, 1923—On clearing between Jawaré and Cumarateea creeks, about 5 miles (8 km.) from Paru, about 150 feet (46 meters) from house.

Joazeiro, Bahia, 1923—Two stations were occupied under large trees on island in São Francisco River, midway between opposite towns of Joazeiro and Petrolina. Station *A* is about 175 feet (53 meters) from northern shore and about 100 feet (30 meters) from southern shore of island, 9.3 feet (2.83 meters) from double tree to northwest and 34 feet (10.4 meters) from tree to northeast, marked by large rough stone about 2 feet (0.6 meter) long and about 7 inches (18 cm.) square, set slightly beneath surface, a cross about 2 inches (5 cm.) down on south-sloping upper face marking exact spot. True bearings: base of flagstaff on right tower of railway station in Joazeiro, 7° 28'.7, left spire of church in Petrolina, 221° 23'.9, right spire of same church, 222° 19'.6, left tower of church in Joazeiro, 317° 53'.5, right tower of same church, 318° 33'.8.

Station *B* is about 150 yards (137 meters) east of station *A,* 14 feet (4.3 meters) southeast of close cluster of three trees, 22.2 feet (6.77 meters) west of nearest of four large trees, 25.4 feet (7.74 meters) north of large double tree, and 103.6 feet (31.58 meters) northwest of northwest corner of house, marked by large rough stone set just below surface, a cross about 4 inches (10 cm.) from highest edge of stone on northerly sloping upper face marking exact spot. True bearings: base of flagpole on right tower of railway station in Joazeiro, 22° 57'.4, flagpole on office building of Viação Fluvial São Francisco, 52° 39'.4, left spire of church in Petrolina, 211° 07'.2, right spire of same church, 212° 17'.8.

Maguary Lighthouse, Marajo Island, Para, 1923—On sand beach, 186 paces west-southwest of lighthouse, and north of and directly in front of keeper's house, 40 feet (12.2 meters) northwest and 45 feet (13.7 meters) northeast respectively of two large hardwood stumps, marked by wooden stake 3 inches (8 cm.) in diameter and 4 feet (120 cm.) long, projecting 1 foot (30 cm.) above sand. True bearing: most southerly upright brace on superstructure of lighthouse, 273° 30'.8.

Manaos, Amazonas, 1924—Two stations were occupied. Station *A* is a close reoccupation of station I of 1918, in suburb called Morro dos Educanos, southeast of

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BRAZIL—*continued*

Manaos, Amazonas, 1924—continued
city and across bay from end of Rua dos Andrades, in street leading to right from top of hill toward Rio Negro, about 150 feet (46 meters) from house marked "Villa Cavalcante 1912," about 20 feet (6 meters) from center of street, about 10 feet (3 meters) south of small trail branching off down hill, and about in line between two mud huts, marked by marble block 36 by 7 by 7 inches (91 by 18 by 18 cm), lettered "C I W 1923," left projecting 2 inches (5 cm) above ground True bearings right edge of large brown house, 0° 12′ 4, square church-tower with white top, 128° 34′.2, dome of opera-house, 151° 40′ 2

Station *B* is about 1 mile (1 6 km) north and 2 miles (3 2 km) west from station *A* This is a close reoccupation of station II, 1918, which is in the plaza in front of Instituto Benjamin and directly in front of a chalet having elaborate marble gate-posts, 201 feet (61 meters) from the wall of Instituto Benjamin and 102 feet (31 meters) from left gate-post at entrance to chalet grounds, marked by a section of unglazed drain-pipe set flush with ground and filled with concrete, exact point marked by a brass rifle shell True bearings base of flagpole on English hospital, 91° 19′ 2, ornament on Instituto Benjamin, 162° 47′ 0, flagpole on red and white house, 244° 41′ 8

Maracanaquara Rapids, Para, 1923—On sand beach on rocky island directly opposite lower end of portage trail around rapids, on left bank of river

Mintipoco Island, Para, 1923—On small sandy island northwest of Mintipoco Island in Mintipoco Rapids True bearing distant tree, 266° 54′ 1

Muraeeka, Para, 1923—On left bank of Paru River about 4 hours' paddling above first big rapids (Muraeeka Rapids), about 40 feet (12 meters) from edge of bank immediately below camping place about one-fourth mile (0 4 km) below large island, the first above rapids and lying at sharp bend where river after flowing southward turns abruptly westward, marked by large, rough stone projecting about 4 inches (10 cm) above ground and squared stake about 4 feet (1 2 meters) high driven alongside, and witnessed by peeled pole about 15 feet (4 6 meters) high set on edge of bank

Novo Horizonte, Para, 1923—In middle of unused street south of the main street and at right angle to river front, 30 8 feet (9 39 meters) west of large tree standing in street, 29 6 feet (9 02 meters) and 35 8 feet (10 91 meters) respectively from northeast and northwest corners of nearest house on south side of street, marked by granite rock, 6 by 8 inches (15 by 20 cm) on top, set one inch above surface and lettered "C I" with cross marking exact point True bearings left gable of last house on front street, 102° 13′ 5, right edge of church door, 273° 47′ 5

Obidos, Para, 1923—Two stations were occupied Station *A* is about 40 feet (12 meters) north of C I W station of 1918 In south part of Praza do Bom Jesus used as football-field, and almost directly in front of gate of barracks, 145 feet (44 2 meters) northeast of southeast corner of house at corner of Justo Chermont and Santa Anna streets, 132 feet (40 2 meters) northeast of third window from south end of same house and in line between window and sharp pyramid on wall of barracks yard, 316 feet (96 3 meters) southwest of door of barracks and in line with center of barracks door and corner of

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BRAZIL—*continued*

Obidos, Para, 1923—continued
building visible through door, marked by concrete block about 12 by 18 inches (30 by 46 cm) on top, set 6 inches (15 cm) under ground, and lettered "C I 1923," exact point being marked by cartridge shell in cement True bearings cross on church, 130° 35′ 2, point on west end of barracks, 199° 16′ 7, point on east end of barracks, 230° 35′ 4, northeast corner of house on Justo Chermont Street, 325° 15′ 9

Station *B* is on high bank of Amazon River, north of football-field facing St Anna's Church, and about one-tenth mile (0 2 km) west of station *A*, on small bare knoll immediately north of larger wooded knoll, and 154 8 feet (47 18 meters) west of most westerly house of row on west side of football-field, marked by concrete block about 8 by 8 inches (20 by 20 cm) square on top, lettered "C I 1923," with exact point marked by brass screw True bearings top of right gate-post of cemetery, 157° 45′ 3, cross on Bom Jesus Church, 210° 03′ 9, center of ball on spire of St Anna's Church, 250° 33′ 3

Orximina, Para, 1923—In north end of village, on open space in front of old Church of St Antonio, on tongue of land between two short ravines, 44 1 feet (13 44 meters) from southwest corner and 45 9 feet (13 99 meters) from southeast corner of veranda in front of church, and about 20 feet (6 1 meters) east of lamp-post at head of most westerly ravine, marked by large stone, point of which is about 8 by 12 inches (20 by 30 cm), protruding about 1 inch (3 cm) above ground, lettered "C I '23," exact point being marked by cross cut in stone True bearing cross on new Church of St Antonio, 302° 16′ 0

Panama Rapids, Para, 1923—At foot of Panama Rapids, first rapids in Paru River, nearly in center of island just above first drop, probably under water in winter months True bearing palm tree on small island up-river, 141° 21′ 6

Papagaia Village, Paru No 8, Para, 1923—In center of small rocky island in middle of Paru River, about one-fourth mile (0 4 km) above village of Aparai Indians known as Papagaia

Pata, Pootinga River, Para, 1923—On cultivated ground back of Pata Village, also known as village of Chief Creshapee, about 200 feet (61 meters) northeast of chief's hut This is the first village found in ascending the Pootinga River, which flows into the Jary River at about 00° 05′ north latitude True bearing tall stake at right of chief's hut, 58° 45′ 6

Pernambuco, Pernambuco, 1923—Two stations were occupied about 4 kilometers west and 2 kilometers south of station of 1913 Station *A* is an exact reoccupation of C I W station of 1919 at old Derby, directly in front of middle entrance to Escola des Artifizes and 106 meters east of its lower steps, 93 5 meters north-northeast of corner of wall on south side of Derby, and 49 7 meters west of rock formerly used as anchor for flagpole guy-line, marked by sharp pointed stone buried 2 or 3 inches (5 or 8 cm) below surface of ground True bearings tip of tower on Governor's residence, 51° 06′ 7, flagstaff at north end of building, 118° 24′ 6, northeast corner of school building, 119° 21′ 9, ball gable-ornament over red gable, 259° 02′ 8

Station *B* is about 250 meters northwest of station *A* on low-lying land close to small river, at back end of residence property belonging to Senhor José Cezar Cantinho, formerly known as old Dantas house and now occupied by Professor A E Hays of

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BRAZIL—*continued*

Pernambuco, Pernambuco, 1923—continued
Collegio Americano Baptista, 49 13 meters southwest of southwest corner of residence, 3 0 meters south of line of south side of residence, marked by large rough stone set almost flush with ground, a cross marking exact spot True bearings ornament at east end of red house, 150 meters, 111° 45′ 3, ornament at right corner of house, 137° 06′ 3, central ornament on façade of house, 166° 26′ 8, staff at east end of roof of house, 200 meters, 327° 58′ 6

Pinheiro, Para, 1923—Two stations were occupied Station *A* is exact reoccupation of Brazilian Magnetic Commission station of 1903, and C.I W station *A* of 1910, 1911, 1914, 1915, 1918, and 1919 In front of Church of St Sebastian, 69 5 meters west of its southwest corner, 62 8 meters north of near side of shore end of government wharf and about 10 meters west of edge of steep river embankment, marked by concrete blocks 28 centimeters square by 4 5 centimeters thick built to a height of 76 centimeters, on top of which is a copper plate bearing data of Brazilian observations Exact point is at edge of copper plate directly over second "R" in "DIRECTORIA," 8 9 centimeters from southeast edge of block and 11 8 centimeters from northeast edge True bearings large brick chimney in Para, 1° 36′ 3, top of ornament on top of Para water-tower, 2° 49′ 6, ornament on far gable of pier-house, 42° 12′
Station *B* is 15 6 meters south of station *A*, in direct line with large, broad chimney in Para, marked with new hardwood tent-peg True bearings large chimney in Para, 1° 35′ 8, top of ornament on water-tower, 2° 49′ 2, base of wind-vane on church in Pinheiro, 272° 46′ 2, lamp-post, 356° 02′ 7

Porteiro Rapids, Para, 1923—On east bank of Trombetas River, at foot of Porteiro Rapids and head of launch navigation, about 30 feet (9 1 meters) east of deep hole caused by eddy in river at high water, and 11 8 feet (3 60 meters) from southeast corner and 11 1 feet (3 38 meters) from southwest corner of more northerly of two huts, marked by large hard stone tapering to a flat top about 6 by 6 inches (15 by 15 cm), projecting about 1 inch (3 cm) above ground, and lettered "C I," the exact point being marked by cross cut in stone

Porto Alegre, Rio Grande do Sul, 1925—Two stations were occupied Station *A* is about 2 miles (3 2 km) east of 1904 station of Brazilian Magnetic Commission, which was unsuitable for reoccupation, on grounds of Porto Alegre College (American), on hilltop to southeast of town, in northern part of campus, 8 0 meters from north fence, and 77 2 meters northeast of northwest corner of main college building, marked by drill-hole in granite post set to project 4 inches (10 2 cm) above ground, top of the stone marked with letters "C I W 1925" True bearings northwest corner of main college building, 35° 42′ 8, church spire, 4 miles (6 4 km), left church spire of two, 4 miles (6 4 km), 91° 18′ 2, spire to left of prominent black building, 2 miles (3 2 km), 135° 45′ 6
Station *B* is 78 6 meters west-southwest of *A*, 49 3 meters northwest of northwest corner of main college building, and 39 1 meters southeast of east gate-post in north fence of college grounds, marked with granite post as at *A* True bearings church cross, 38° 40′ 3, left church spire of two, 91° 41′ 4, spire to left of prominent black building, 138° 31′ 8, northwest corner of main college building, 321° 33′ 3

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BRAZIL—*continued*

Porto Velho, Amazonas, 1924—Two stations were occupied Station *A* is close reoccupation of C I W station of 1917, east of steel water-tanks behind manager's house and west of church under construction, in direct line with southwest wireless mast and downpipe of most westerly steel water-tank, 296 feet (90 2 meters) southeast of most easterly water-tank, about 150 yards (137 meters) northeast of Hotel Brasil, and about 10 feet (3 meters) east of path, marked by concrete block projecting about 3 inches (8 cm) from earth, lettered "CIW 1924," exact point being marked by brass cartridge shell set in concrete True bearings southeast wireless mast, 133° 04′ 7, most easterly wireless mast, third section from top, 150° 01′ 7, cross on small church, 323° 56′ 1
Station *B* is on north side of road, 411 7 feet (125 48 meters) north of station *A* and in direct line with station *A* and most easterly wireless mast, about 20 feet (6 meters) south of path, 45 yards (41 meters) east of small white house, and 30 yards (27 meters) west of large unpainted house, marked by concrete block set almost flush with ground, lettered "C I W 1924," exact point being marked by brass cartridge shell set flush with concrete True bearing fifth section from top of most easterly wireless mast, 150° 01′ 7

Presidente Murtinho, Matto Grosso, 1925—At a telegraph station on the Cuyaba-Goyaz line, inhabited by an Indian colony and commonly known as "Sangadouro" It is near center of main courtyard, 32 5 meters west of southwest corner of nuns' building, 52 9 meters east of northeast corner of most northerly hut of row occupied by priests, and 24 3 meters south of a wooden fence inclosing cattle pen, marked by peg True bearings left trunk of lone tree on horizon, 2 miles (3 2 km), 2° 58′ 6, right edge of most northerly hut, 98° 50′ 6, right corner of building occupied by nuns, 281° 49′ 3

Registro, Matto Grosso, 1925—Practical reoccupation of C I W station of 1915, at east end of street known as "Rua Doctor Morbeck," about 70 meters west of Araguaya River, 45 0 meters south of last house on north side of street and 55 5 meters northwest of northwest corner of small shed, marked by a bone 28 centimeters long, set flush with ground True bearings left edge of doorway at end of street, 300 meters, 37° 30′ 2, right edge of tree trunk, 114° 23′ 8

Rio Grande, Rio Grande do Sul, 1925—Two stations were occupied near site of station of Brazilian Magnetic Commission of 1904, on low ground east of gas-tank and south of Rua Marechal Floriano Station *A* is about 150 meters south of south line of Rua Marechal Floriano marked by peg True bearings right edge of cornice on top of large chimney, 1 mile (1 6 km), 57° 19′ 0, church spire, one-half mile (0 8 km), 103° 37′ 2, northwest corner of two-story building, 300 meters, 166° 58′ 6, left edge of chimney, 1 mile (1 6 km), 331° 49′ 6
Station *B* is a close reoccupation of C I W station of 1913, 105 yards (96 meters) northwest of *A* and 67 yards (61 meters) south of south line of Rua Marechal Floriano, marked by peg True bearings right edge of cornice on top of large chimney, 50° 50′ 7, church spire, 93° 54′ 3, northwest corner of two-story building, 173° 52′ 6, left edge of chimney, 331° 57′ 2

Rio Manso, Matto Grosso, 1925—At a telegraph station about 108 kilometers east of Cuyaba, on the Cuyaba-Goyaz trail, on a clear open space 48 2 meters south of the southwest corner of telegraph station, 34 1

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BRAZIL—*continued*

Rio Manso, Matto Grosso, 1925—continued meters north-northwest of northwest corner of mud house, and 34 4 meters north-northwest of northeast corner of same mud house, marked by tip of bull's horn buried 10 centimeters below surface of ground True bearings left edge of trunk of distant tree, about 1 mile (1 6 km), 23° 29′ 0, left edge of telegraph station, 169° 18′ 4, right edge of hut, 250 meters, 247° 27′ 8

San Luis, Maranhão, 1923—Two stations were occupied Station *A* is north of city, across river and tidewater channel, in grounds of "Asylo de Mendicidade" in charge of Masonic Lodge, 123 8 feet (37 73 meters) southwest of southwest corner of main building, and 132 5 feet (40 39 meters) northeast of northeast corner of superintendent's residence, marked by rough stone about 20 inches (51 cm) long, set almost flush with surface, and lettered "C I," a cross marking exact point True bearings dome of prominent church building, 2° 41′ 5, left spire of cathedral, 23° 04′ 2, right spire of cathedral 23° 17′ 5, spire of church at Praia Genipapero, 335° 50′ 3

Station *B* is 230 7 feet (70 32 meters) southwest of station *A*, in direct line with station *A* and right spire of cathedral and 84 1 feet (25 63 meters) south-southwest of southeast corner of superintendent's house, marked by a building tile about 10 centimeters square and 30 centimeters long, set flush with surface of ground, a cross marking exact spot True bearings dome of large prominent church, 1° 43′ 9, left spire of cathedral, 23° 03′ 9, right spire of cathedral, 23° 17′ 5, spire of church at Praia de Genipapero, 332° 37′ 2

San Luis, Campo do Durique, Maranhão, 1923—Near center of Campo do Durique, and is found by measuring 122 7 feet (37 40 meters) from an obelisk eastward along line through obelisk from center of east entrance to quartel to a point, and thence southward 39 feet (11 9 meters) toward central ornament over arched gateway, marked by peg driven flush with ground True bearings central ornament over arched gateway, 11° 26′ 4; cross on church near southwest corner of campo, 36° 47′ 9, cross on church near northwest corner of campo, 135° 00′ 0

Santa Isabel, Amazonas, 1924—Close reoccupation of C I W station of 1913 On Tapuraquara Island, opposite village of Santa Isabel, in open field used as pasture south of two houses, about 200 feet (61 meters) southwest of tall palm tree, 98 feet (29 9 meters) northeast of most southerly palm tree, and about 20 feet (6 meters) northwest of line drawn between the two, and 102 feet (31 1 meters) southeast of large tree, marked by concrete block 7 by 7 inches (18 by 18 cm) on top, lettered "C I 1924," exact point marked by brass cartridge shell set in concrete, and projecting about 1 inch (3 cm) above ground True bearing west gable of house with iron roof on south bank of river, 4° 21′ 0

Santarem, Para, 1923—Two stations were occupied Station *A* is about 100 feet (30 5 meters) southeast of C I W station of 1918, in Praza Republicana, west of Concepcion Church, about 99 feet (30 meters) southeast of station of 1918, 104 9 feet (31 97 meters) southeast of southeast corner of tile building on north of Praza near river, 140 0 feet (42 7 meters) west of northwest corner of large house on east side of Praza, and 119 feet (36 27 meters) and 117 feet (35 66 meters) north of two large trees respectively on south of Praza, marked by concrete block 9 by 9 by 16 inches (23 by 23 by 41 cm), lettered "C I W," the exact point marked by large copper rivet flush with concrete True bearings wireless mast, 84° 17′ 9, cross on Concepcion Church, 242° 59′ 3

Station *B* is at southern extremity of street called Travessa Barão do Rio Branco, lying between convent grounds and cemetery, 10 feet (3 meters) south of line joining corner of cemetery and corner of convent grounds, 34 4 feet (10 48 meters) southwest of corner of cemetery, and 38 9 feet (11 85 meters) southeast of corner of convent grounds, marked by concrete block 18 inches (46 cm) deep and about 9 by 9 inches (23 by 23 cm) on top, extending about 1 5 inches (4 cm) above ground, and lettered "C I W 1923," the exact point being marked by a large copper rivet set flush with concrete True bearing base of cross on Concepcion Church, 170° 20′ 1.

Santos, São Paulo, 1923, 1925—Two stations were occupied in 1923 and reoccupied in 1925 Station *A* is at São Vicente, a suburb west of Santos, on grounds of Santos Golf Club, about 1 kilometer north of village, on low, flat-topped ridge running east and west across middle of grounds, 10 3 feet (3 14 meters) northeast of most northerly of group of large trees, 59 6 feet (18 17 meters) from tree bearing south 40° east, 100.3 feet (30 57 meters) from tree bearing south 60° east, and 112 4 feet (34 26 meters) northwest of hole No 1 of golf-course, marked by granite stone 6 by 6 by 24 inches (15 by 15 by 61 cm), set flush with ground, and lettered "C I W 1923," a drill-hole at center marking exact spot True bearings right-hand side of chimney of glass factory in São Vicente, 2° 08′ 1, northwest corner of club-house near foundation, 8° 39′ 9, central raised portion of façade on house, 1¼ miles (2 0 km), 357° 53′ 6

Station *B* is 397 6 feet (121 2 meters) east of station *A*, at east side of golf grounds, 15 feet (4 6 meters) southwest of hedge running from northwest to southeast, 64 9 feet (19 78 meters) northeast of hole No 3, 30 feet (9 1 meters) southeast of east end of bunker close to hedge, and 159 feet (48 46 meters) northeast of nearest of large trees on ground, marked by granite post, 6 by 6 by 24 inches (15 by 15 by 61 cm), set almost flush with surface of ground, and lettered "C I W 1923," a drill-hole at center marking exact spot True bearings central raised portion of façade on house, 1¼ miles (2 0 km), 1° 47′ 4, right-hand side of large brick chimney of glass factory in São Vicente, near top, 9° 58′ 5, northeast corner of club-house, near foundation, 27° 36′ 9, station *A*, 95° 32′ 9

São Antonio de Cachoeira, Para, 1923—About 10 feet (3 0 meters) north of path leading from director's house to river

São Felix, Para, 1923—On bank of Rio Fresco near its junction with Xingu River, to left of path leading from boat-landing, in open space between street and top of river bank, 35 9 feet (10 94 meters) west from west post of south end of bridge across small stream, 22 feet (6 7 meters) southwest of top of small stream bank, and 30 feet (9 1 meters) southeast of top of river bank, marked by hard granite stone about 8 by 10 inches (20 by 25 cm) on top, lettered "C I" True bearings north edge of south window of most southerly house in Front Street, 36° 06′ 4, base of crooked tree across Xingu River, 72° 54′ 6

SOUTH AMERICA

BRAZIL—*continued*

São Paulo de Olivença, Amazonas, 1924—On south bank of Amazon River, and almost directly across river from C I W station of 1910 (Amazon 14) of which it is a proximate reoccupation, on a high hill northeast of house at end of street occupied by priests of mission, about 500 feet (152 meters) directly west of bakery and 20 feet (6 meters) from river bank True bearing right edge of door of bakery, 278° 16′ 0

São Sebastião (Xingu River), Para, 1923—On west bank of Xingu River, on high hill directly back of main building, on grassy spot near middle of hill, about 40 feet (12 meters) from edge of bluff, marked by granite rock, set so as to project 2 inches (5 cm) above ground, and lettered "C I," the exact point being indicated by a cross True bearing right edge of middle window of largest house across Xingu River, 205° 49′ 7

São Vicente, São Paulo, 1923—See Santos

Serredina, Goyaz, 1925—At a fazenda about midway between Registro and Goyaz, approximately 50 meters south of the Cuyaba-Goyaz telegraph line, 45 paces north and slightly west of the northeast corner of a small house with thatched roof, 30 2 meters east of large tree, and 13 5 meters southwest of small tree, marked by bone True bearings left edge of left palm tree of two on horizon, 1 5 miles (2 4 km), 50° 14′ 2, highest peak on mountain, 3 miles (4 8 km), 281° 49′ 4, left edge of window of house with thatched roof, 342° 10′ 2

Souré, Marajo Island, Para, 1923—In open space between front street and river, 64 1 feet (19 54 meters) southeast of concrete post at south side of entrance to concrete dock, 45 6 feet (13 90 meters) south of lamp-post at end of dock paving and in line with lamp-post and Centenario Monument, and 49 1 feet (14 97 meters) northeast of hollow iron post used as mooring for steamers, marked by concrete block about 18 inches (46 cm) deep and 14 inches (36 cm) square on top, set flush with ground and lettered "C I 1923," the exact point marked by brass cartridge shell set flush with concrete True bearings east gable of white house across river, 93° 34′ 2, east gable of roof of old dock, 153° 38′ 9, cross on large tombstone in cemetery at north end of town, 164° 53′ 2

Takara Rapids, Para, 1923—On rocks at down-stream end of portage trail around second big rapids above mouth of Jary River, on right bank about 100 feet (30 5 meters) east of portage trail, and about 33 feet (10 1 meters) south of large boulder lying on flat space on rocks near bank of river, marked by cross cut in rock

Tapiocawa Rapids, Para, 1923—On small rocky island near western bank of Paru River, nearly opposite upper end of portage trail around rapids, above mouth of Tapiocawa Creek

Toure Falls, Para, 1923—At up-stream end of portage trail around Toure Falls, on right bank of Paru River, on flat rocks, submerged part of year, about 100 feet (30 5 meters) down stream below camping place

Uberaba, Minas Geraes, 1925—On hill west of main section of town, near center of Largo (Square) Don Edwards, 31 0 meters west of northwest corner of Meteorological Observatory inclosure, 14 6 meters northeast of north corner of base of large wooden cross, and 37 5 meters southwest of building line on

SOUTH AMERICA

BRAZIL—*continued*

Uberaba, Minas Geraes, 1925—continued
Rua Merceis, marked by cross cut in rectangular stone buried flush with ground True bearings gable of distant house, 3 5 kilometers, 266° 36′ 8, cathedral spire in Uberaba, 2 kilometers, 313° 59′ 2, right edge of church cross, 200 meters, 337° 11′ 3

Vassouras, Rio de Janeiro, 1923, 1925—Intercomparison observations were made in absolute house of National Observatory of Brazil about 1 mile (1 6 km) northeast of Vassouras Observations for declination and horizontal intensity were made on piers *A* and *B*, and for inclination on piers *B* and *C* True bearings azimuth of pillar from Pier *A*, 146° 40′ 7, azimuth of pillar from Pier *B*, 148° 04′ 1

Veado, Para, 1923—On steep bank of Lake Irapecu, in flat bare space in front of shed just south of main place of business, 20 2 feet (6 16 meters) southeast of southeast corner of main house, and 4 2 feet (1 28 meters) east of center of east end of shed True bearing right edge of south door of house across arm of lake, 261° 34′ 0

Victoria, Espiritu Santo, 1923—Three stations, *A*, *B*, and *C*, and two secondary stations, *D* and *E*, were occupied, on account of the large local disturbance, across ship channel, south of city, on land surrounding residence property of João de Deus Netto Station *A* is in middle of roadway on hillside sloping down from front of house, 124 8 feet (38 05 meters) and 142 7 feet (43 49 meters) from northwest and southwest corners respectively of house, and 4 5 feet (1 37 meters) north of extension of line of north side of porch, marked by a native granite stone set flush with surface of grass-covered roadway True bearings electric light standard over main entrance to governor's residence, 117° 29′ 3, dome of state building, 124° 12′ 6, tip of tower on cathedral, 133° 10′ 2, tip of tower on Egreja Rosario, 154° 15′ 5

Station *B* is about 120 paces southeast of station *A*, 29 paces east of a point on line of east side of residence of Senhor Netto 65 paces south of southeast corner, and 38 3 feet (11 67 meters) north of cross cut in top of most westerly of cluster of boulders on point of hill, marked by large granite stone, the upper end being almost exactly an 8-inch (20-cm) equilateral triangle, projecting about 2 5 inches (6 cm) above ground, a cross near center marking exact spot True bearings ornament at northeast corner of governor's residence, 119° 52′ 0, tip of dome on state building, 126° 14′ 8, tip of dome on Monastery of Villa Velha, 273° 01′ 3

Station *C* is about 265 paces south of station *A*, near southerly end of an oblong hill, 48 7 feet (14 84 meters) nearly due south of cross cut in center of large rock 5 5 feet (1 68 meters) long, 16 to 20 inches (41 to 51 cm) wide, and extending about 12 inches (30 cm) above ground, the western terminal of outcropping ledge, 60 feet (18 3 meters) north of scrubby tree, and 40 feet (12 2 meters) west of dense cluster of brush, marked by large native stone, the rounded upper end being set so as to project about 1 inch (2 cm) from ground, a cross cut near center marking exact spot True bearings central ornamental pyramid on façade of cathedral, 144° 44′ 8, tip of tower on church, 161° 28′ 4, station *A*, 187° 20′, ornament at left corner of house on mountain, 273° 05′ 0

Station *D* is 189 3 feet (57 70 meters) north 14° 13′ 0 east of station *A*

Station *E* is 120 paces south 34° 39′ 0 west of station *A*

Victoria (Rio Xingu), Para, 1923—In open field used as pasture land west of street, 59 0 feet (17 98 meters)

SOUTH AMERICA

BRAZIL—*concluded*

Victoria (Rio Xingu), Para, 1923—continued
south of southwest corner of blacksmith shop, 51 0 feet (15 54 meters) west of southwest corner of harness shop, and 51 3 feet (15 64 meters) southeast of large post at jog in pasture fence, marked by concrete block 10 by 12 inches (25 by 30 cm), projecting about 1 inch (3 cm) from ground, lettered "C I '23," the exact point being indicated by a cross True bearings right edge of right doorframe of small building used to shelter acetylenegas generator, 258° 10′ 8, north gable of house called "chalet," 345° 04′ 2

CHILE

Antofagasta, Antofagasta, 1924—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1917, about 150 meters east of railroad, and almost due east of Calle Bolivar, in saddle just east of prominent point on third ridge south of large wooden cross which stands on a stone base, 3 meters from summit of small knob to north, 5 meters and 6 meters respectively from summits of small knobs to southeast and southwest, marked by cross in rough stone True bearings tip of right wireless mast, 2 5 miles (4 0 km), 31° 14′ 0, church tower, 2 miles (3 2 km), 121° 14′ 4, large wooden cross, 150 meters, 190° 29′ 8

Station *B* is 270 feet (82 30 meters) southwest of station *A* and on second ridge south It is 6 meters west of center of small knob and 10 7 meters north of a second small knob, marked by a cross in a rough native stone True bearings tip of right wireless mast, 30° 24′ 1, church tower, 123° 11′ 2, large wooden cross, 220° 23′ 4

Arica, Tacna, 1924—Two stations were occupied Station *A* is a close reoccupation of C I W stations of 1913, 1914, and 1917, on sandy plain about 1 5 kilometers northeast of town, 120 2 feet (36 64 meters) southwest and 124 1 feet (37 83 meters) northwest of west and southwest corners respectively of cemetery wall, marked by cross in rough native stone, about 12 by 12 by 24 inches (30 by 30 by 61 cm) Former mark had been lost in drifting sand True bearings flagpole on square tower in front of pest-house, one-fourth mile (0 4 km), 7° 11′ 2, monument on Morro Hill, one-half mile (0 8 km), 75° 16′ 7, flagpole on barracks, one-fourth mile (0 4 km), 159° 06′ 8

Station *B* is 267 5 feet (81 53 meters) south-southwest of *A*, 80 2 feet (24 45 meters) west of west corner of garden fence at cemetery entrance and 58 2 feet (17 74 meters) northwest of edge of paved road leading to cemetery, marked by inverted glass bottle buried flush with the ground True bearings flagpole on square tower in front of pest-house, 7° 08′ 3, windmill, 40° 48′ 4, church tower, 87° 35′ 2

Calama, Antofagasta, 1925—Close reoccupation of C I W station of 1912 About 2 kilometers south of town in southwest corner of clearing about 200 meters west-southwest from corner of fence on east side of road, 63 5 meters at right angles west of that fence, and 42 2 meters south and slightly east of a mud and stone monument, used as a landmark and known as a "Mojón", marked by inverted glass bottle buried flush with ground and covered with small stones and sand True bearings peak on water-tank at Du Pont's 3 5 kilometers, 26° 46′ 6 peak of house roof in Calama 2 5 kilometers 191° 59′ 1, flagpole on house in Calama, 2 5 kilometers, 200° 12′ 6

SOUTH AMERICA

CHILE—*continued*

Copiapo, Atacama, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1917 About one-fourth mile (0 4 km) southeast of railroad station, in pasture surrounded by ruins of mud wall, southwest of Calle Carera and between Calle Alamada and Calle Rancagua, 32 6 meters northeast of southwest wall, 6 0 meters northwest and 8 0 meters southwest of irrigation ditch which forms an angle east of station, marked by cross in well-cut stone 12 by 12 by 24 inches (30 by 30 by 61 cm) buried flush with ground True bearings cross on church one-half mile (0 8 km), 41° 53′ 3, left edge of office of American Smelting Company, 275° 12′ 8, most easterly mountain peak, 5 miles (8 km), 357° 35′ 4

Station *B* is 135 9 feet (41 42 meters) east of *A*, nearly on line joining *A* and left edge of office of American Smelting Company, marked as at *A* True bearings cross on church, 46° 42′ 4, left edge of office of American Smelting Company, 275° 13′ 7

Coquimbo, Coquimbo, 1925—Two stations were occupied Station *A* is a practical reoccupation of C I W station of 1917, southeast of town, northwest of cemetery, on beach, on ground which was formerly the foundation of a "quinta" or ranch-house and which is about 3 feet (0 91 meter) higher than the surrounding beach It is 19 0 feet (5 79 meters) from the northwest edge of this foundation, 20 5 feet (6 25 meters) north of palm tree, and 43 1 feet (13 14 meters) west of tree northeast of palm tree, marked by cross cut in native stone about 30 centimeters square, set flush with ground True bearings cross on hill behind Coquimbo, 1 mile (1 6 km) 151° 25′ 9, monument in La Serena, 9 miles (14 5 km), 231° 02′ 2, left wireless tower, one-half mile (0 8 km), 269° 26′ 8, right wireless tower, 273° 44′ 2, spire on large house, one-half mile (0 8 km), 300° 18′ 4 All former houses were completely destroyed by the tidal wave of 1922

Station *B* is 161 0 feet (49 07 meters) from *A* in direct line to monument in La Serena, 105 0 feet (32 00 meters) north of east corner of foundation of old "quinta", marked by cross in rough stone set flush with ground True bearings cross on hill behind Coquimbo, 149° 57′ 6, monument in La Serena, 231° 02′ 2, left wireless tower, 270° 24′ 6, right wireless tower, 274° 45′ 8, spire on large house, 302° 11′ 2

Coronel, Concepcion, 1925—Two stations were occupied Station *A* is practical reoccupation of C I W station *A* of 1918, on sandy plain about 1 kilometer southeast of town, about 200 meters northwest of former slaughter-house, approximately in line with slaughter-house and chimney of soap factory, about 75 meters west of wagon road, on small flat knoll about 2 meters high and almost bare of vegetation, and nearly in line with fence at west side of second street east of soap factory, marked by peg True bearings right side of chimney at Lota Lighthouse, 24° 57′ 8, corner of house at Puchoco Lighthouse, 3 miles (4 8 km), 107° 07′ 6, chimney of soap factory, 1 kilometer, 154° 51′ 2, gable of slaughter-house, 200 meters, 321° 14′ 6, gable of house, 200 meters 336° 15′ 2

Station *B* is 84 feet (25 60 meters) southwest of *A* and on line to right side of chimney at Lota Lighthouse, marked by peg True bearings right side of chimney at Lota Lighthouse, 24° 57′ 8, chimney of soap factory, 156° 21′ 7, gable of house, 332° 40′ 5

Corral, Valdivia, 1925—Close reoccupation of C I W station of 1913 In small clearing on promontory

SOUTH AMERICA

CHILE—continued

Corral, Valdivia, 1925—continued about 250 yards (230 meters) southwest of oil refinery, 8 paces east of path, and 13 paces from shrubbery which forms south edge of clearing, marked by cross cut in rock 30 by 30 centimeters square True bearings tower of Resguardo, 1 5 miles (2 4 km), 25° 56′ 2, flagpole on house on hill, 2 5 miles (4 0 km), 246° 11′ 0, left edge of left smoke-stack at steel foundry, 2 miles (3 2 km) 343° 09′ 6

Iquique, Tarapaca, 1924—Close reoccupation of C I W station of 1917 On Serrano Island, about 250 meters southeast of lighthouse, and near south edge of irregular plat in center of island, 5 8 meters north of south edge of plat, and 22 meters southwest of center of low pile of stones, marked by cross in rough native stone, about 2 feet (0 6 meter) square by 3 feet (0 9 meter) deep True bearings tip of lighthouse, 250 meters, 155° 17′ 7, cross on church, 1 5 miles (2 4 km), 268° 00′ 4, cross on cathedral, 1 mile (1 6 km), 287° 44′ 0

Puerto Montt, Llanquihue, 1925—Two stations were occupied Station *A* is close reoccupation of C I W station of 1919, on northeast extremity of Tenglo Island in open grass-plot, about 100 meters north of three large red buoys, 16 5 feet (5 03 meters) north of wooden stockade fence which incloses new large wooden house, 40 1 feet (12 22 meters) west of barbed-wire fence inclosing grass-plot, marked by peg covered with stones Former marks could not be found, the house and fence having been removed True bearings flagpole on mainland, three-fourths mile (1 2 km), 110° 04′ 8, church tower, 1 mile (1 6 km), 173° 47′ 8, church at plaza, 1 mile (1 6 km), 212° 15′ 6, church tower, 1 5 miles (2 4 km), 223° 55′ 5

Station *B* is 120 feet (36 58 meters) west-northwest of *A* in line with flagpole on mainland, marked by cross cut in small rough native stone True bearings near gable of small house by hillside, one-fourth mile (0 4 km), 44° 58′ 9, flagpole on mainland, 110° 04′ 8, church tower on mainland, 175° 43′ 5

Punta Arenas, Magallanes, 1925—Three stations were occupied Stations *A* and *B* are near C I W station of 1919 and the Argentine Meteorological Office station of 1913, on hill southwest of town, about 3 5 miles (5 6 km) from plaza Muñoz Gamero, in district known as Miraflores Station *A* is in a field near edge of a small rise and is 84 5 feet (25 76 meters) northwest of a barbed-wire fence along Calle Barrio and practically on line with wooden fence running along southside of Calle Miraflores, now only a path extending southeast from Calle Barrio, marked by drill-hole in center of dressed marble monument, 8 by 13 by 24 inches (20 by 33 by 61 cm) projecting 2 inches (5 cm) above ground and lettered "C I W A 1925" on top True bearings left of six wireless masts, 5 miles (8 km), 218° 01′ 1, church cross at plaza, 3 5 miles (5 6 km), 230° 09′ 8, spike on red-roofed house on beach, 1 mile (1 6 km), 256° 36′ 2

Station *B* is 75 9 feet (23 13 meters) southwest of station *A* on line with left of six wireless masts, 30 5 meters northwest of barbed-wire fence along Calle Barrio, marked with marble monument as at *A*, substituting the letter *B* for *A* True bearings left of six wireless masts, 5 miles (8 km), 218° 01′ 1, church cross at plaza, 3 5 miles (5 6 km), 230° 01′ 0, spike on red-roofed house near beach, 1 mile (1 6 km),

SOUTH AMERICA

CHILE—concluded

Punta Arenas, Magallanes, 1925—continued 255° 33′ 4, extreme left point of island, 4 miles (6 4 km), 306° 01′ 2

Station *C* is about 2 miles (3 2 km) north and slightly east of plaza Muñoz Gamero, on the grounds of the hipodromo or race-course of Punta Arenas In the northeast corner of the football-field, 84 5 feet (25 76 meters) from the northeast goal-post and 228 0 feet (69 49 meters) east of inner wooden fence surrounding the race-track, marked by peg True bearings church spire, 1 mile (1 6 km), 39° 18′ 4, flagpole on grand-stand, 300 meters, 76° 43′ 8, left of six wireless masts, 2 miles (3 2 km), 212° 56′ 6, right edge of house, one-fourth mile (0 4 km), 282° 24′ 8

Ultima Esperanza, Magallanes, 1925—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1919, at Puerto Bories 400 meters north of the Sociedad Explotadora's sheep freezer in open field at foot of small hill and about 400 meters northwest of the Bories wireless station It is 16 54 meters southeast of wooden sheep-race, 25 9 meters southwest of top of large rock, and 24 30 meters northwest of wooden fence, marked by cross cut in rough native stone about 30 centimeters square at top, buried flush with ground True bearings top of right side of left chimney at freezer, 4° 04′ 6, top of right side of right chimney at freezer, 9° 00′ 4, telegraph-pole, 400 meters, 221° 37′ 7, right gable wireless office, 303° 26′ 2, flagpole at freezer, 350° 41′ 3

Station *B* is 39 0 meters south 41° 38′ 7 west from *A*, 7 16 meters southeast of sheep race, 17 68 meters northeast of wooden fence, marked by cross cut in rough native stone buried flush with ground True bearings right side of right chimney at freezer, 3° 10′ 1, flagpole at freezer 338° 48′ 0, right side of left chimney at freezer, 357° 42′ 8

Valparaiso, Valparaiso, 1925—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1917, about 8 kilometers southeast of Valparaiso, between two roads out of city which unite near Miradero O'Higgins monument, on well-defined level spot on top of very prominent ridge about 250 meters northwest of and below monument, 7 meters from north edge, 5 5 meters from east edge, 10 meters from south edge, and 8 meters from west edge of level spot, marked by cross cut in rough native stone about 15 centimeters square on top True bearings white stone on hillside, 1 mile (1 6 km), 72° 11′ 5, peak on house in Valparaiso, 8 kilometers, 153° 13′ 6, letter *A* on O'Higgins monument, 341° 09′ 8

Station *B* is 162 0 feet (49 38 meters) northwest of *A*, 16 4 feet (5 00 meters) southeast of a tree and 18 6 feet (5 67 meters) northeast of a second tree, marked by cross cut in rough native stone about 22 centimeters square on top True bearings left white monument at end of road in valley, 3 miles (4 8 km), 176° 47′ 0, telephone-pole, one-fourth mile (0 4 km), 262° 25′ 3, station *A*, 325° 06′ 0

COLOMBIA

Barranca Bermeja, Santander, 1922—On property of Tropical Oil Company, in outfield of baseball-field, on continuation of first-base foul-line about 200 feet (61 meters) east of first base, 92 feet (28 meters) north of northeast stone pier supporting house nearest gully running north and south through property, and 50 7 feet (15 45 meters) northwest of fourth

SOUTH AMERICA

COLOMBIA—*continued*

Barranca Bermeja, Santander, 1922—continued fence-post east of house, marked by 1 by 2 inch (3 by 5 cm) surveyor's peg driven flush with ground, its center designated by a brass screw True bearings gable end of last house in row by river, 81° 49′3, base of figure 7 on tank No 7, 255° 53′6, lower right edge of right stack of power-house, 291° 53′2, tip of tall flagpole in front of club-house, 334° 56′8

Bogota, Cundinamarca, 1922—Two stations, *A* and *B*, were occupied Station *A* is about 120 feet (36 6 meters) northwest of C I W station of 1909 and 1914, in field owned by Señor Montaña, east of Calle 26, about one-half mile (0 8 km) north of cemeteries, in small section of field about 200 feet (61 meters) square, inclosed by wire fence on three sides, 125 feet (38 10 meters) southwest of southwest corner of hut inclosed by wire fence, 45 feet (13 7 meters) east of ditch, and 25 feet (7 6 meters) north of wire fence, marked by stake driven flush with surface of ground True bearings top of brick stack of factory, 240° 58′2, tower of Iglesia de la Monseirate, 312° 50′4

Station *B* is about 200 feet (61 meters) northwest of station *A*, in northwest corner of southeast section of field divided off by wire fences, 22 1 feet (6 74 meters) south of east-west fence, and 53 4 feet (16 28 meters) east of north-south fence, marked by wooden stake True bearings gable of house, 124° 25′2, brick stack of factory, 245° 17′4

Buenaventura, El Valle del Cauca, 1923—Close reoccupation of C I W station of 1909, on left side of road running parallel to harbor as far as All-America Cable station, in small basin about 150 yards (137 meters) north of cable station, just below and south of top of ridge on which are ruins of concrete structure, 38 feet (11 6 meters) northeast of road, and 20 3 feet (6 19 meters) southeast of concrete post nearest road and cable station, marked by round boulder set flush with surface of ground, a drill-hole designating center True bearing. cupola of church, 167° 50′1

Calamar, Bolivar, 1922—Close reoccupation of C I W station of 1909, in pasture field belonging to Miel family, next to large cattle ranch, and on side of railroad farthest from river, west of second gate reached by following railroad north from railroad station, in clearing about 200 feet (61 meters) from gate and 50 feet (15 meters) north of south fence, marked by wooden stake True bearings right top edge of tall stump, 200 feet (61 meters), 93° 52′8, telegraph-pole beyond curve in railway, 214° 59′8

Cali, El Valle, 1923—On property of brewery, on north bank of Cali River, about 200 yards (183 meters) west of brewery buildings, about 250 feet (76 meters) north of bank of ravine through which river flows, 63 2 feet (19 26 meters) south of wire fence beside small stream, 88 2 feet (26 88 meters) northwest of base of very large tree, and about 75 feet (23 meters) southwest of intersection of wire fence and stream, marked by wooden stake True bearings base of spire on church, 2° 32′7, electric globe at entrance to Majestic Hotel, 299° 07′5, vane on dome of cathedral, 301° 31′8

Cartagena, Bolivar, 1922—Approximate reoccupation of C I W station of 1908, 1909, which could not be recovered because of a swamp, on small mound close by end of Fort La Tenaza nearest rock breakwater, outside residential district Cabrero, and about 150 feet (46 meters) northwest of C I W station of 1908, 1909, 32 feet (9 8 meters) south of corner of wall nearest breakwater, and 15 feet (4 6 meters) measured perpendicularly to wall, marked by irregular stone with drill-hole in center True bearing lighthouse, 49° 51′6

Honda, Tolima, 1922—About 100 yards (91 meters) south of C I W station of 1909, on top of higher of two terraces facing railroad, in direct line of Carrera 12A running east and west through town, 29 feet (8 8 meters) east of path leading up to hill, 50 feet (15 meters) west of edge of terrace facing railroad, 98 9 feet (30 14 meters) northeast of northeast corner of native house, and 38 feet (11 6 meters) southwest of southwest corner of stable, marked by 2-inch (5-cm) peg, driven flush with surface of ground True bearing top of church tower, 344° 55′6

Infantas, Santander, 1922—On property of Tropical Oil Company at Infantas, the headquarters for well-drilling operations, in mule corral at base of high hill upon crest of which are located the various camp buildings, about 400 feet (122 meters) southwest of southeast corner of saddle house, 35 0 feet (10 67 meters) west of base of lone tall tree stump, and about 100 feet (30 meters) west of roadway, marked by peg True bearings southeast corner of saddle house, 199° 11′8, right gable of ventilator on director's house, 235° 52′0, gable of mess-hall, 269° 55′0

La Playona, Choco, 1922—On coconut plantation La Playona, connected with the Cartagena Water-Works, Ltd, on west shore of Gulf of Urabia, about 15 miles (24 km) south of Panama-Colombian boundary line, and about 7 miles (11 km) south of Acandi, the nearest town, 47 paces north of north gate in wall surrounding house, and 17 paces south of shore-line, marked by a 3 by 3 inch (8 by 8 cm) post 3 feet (0 9 meter) long, projecting 6 inches (15 cm) above ground, to be replaced by a concrete post True bearings rock in sea known as "Sugar Loaf Rock," 10 miles (16 km), 150° 45′4, northeast post of veranda of office, 349° 54′4

Medellin, Antioquia, 1922—On top of small hill, near intersection of continuations of Bomboma and Heraldo streets, in line with Heraldo Street, 60 feet (18.3 meters) north of path continuing Bomboma Street, 20 feet (6 meters) south of edge of bank of gully through which runs small stream, 12 feet (3 7 meters), and 32 feet (9 8 meters) from cactus hedges east and west respectively, marked by stake driven flush with surface of ground True bearings center of base of Christ statue on hill, 23° 54′0, cross on southwest tower of university, 164° 10′2, right edge of stack of factory, 221° 25′4, base of cross on high steeple of church, 277° 03′2

Puerto Berrio, Antioquia, 1922—Close reoccupation of C I W station of 1909, on flat top of small hill 100 feet (30 5 meters) high south of hotel, occupied by three houses of employees of Antioquia Railroad, 24 paces east of west edge of bank of Magdalena River 10 paces west of east edge of river bank, and 101 paces southwest of southeast corner of wire fence around railroad quarters, marked by a 2-inch (5-cm) square peg True bearings gable end of rear house 202° 16′6, gable end of front house, 210° 53′6, left gable of house at edge of hill, 257° 15′4, right gable of house at edge of hill, 260° 01′6

SOUTH AMERICA

Ecuador

Guayaquil, Guayas, 1924, 1926—Close reoccupation of C I W station of 1916, on "Hacienda Atarazana" managed by Mr Higgins, half mile (0 8 km) north of city reservoir on Santa Ana hill, on level plain and on bank of a broad, shallow ditch, about 75 yards (69 meters) east of road, about one-fourth mile (0 4 km) west of river, 328 yards (300 meters) east of windmill and 21 5 yards (19 7 meters) east of tree which is almost in ditch, marked by concrete monument one meter long, 25 centimeters square, projecting about 8 centimeters above ground, lettered "C.I.W 1924," exact point marked by cross True bearings windmill center, west of road, 84° 09′ 1, second telephone-pole north of ditch, 137° 35′ 0, tallest pole on Santa Ana hill, 330° 05′ 6, left-edge of ventilator on house on reservoir, 339° 26′ 8

Quito, Pichincha, 1924, 1926—Two stations were occupied Station *A* of 1924 is a close reoccupation of C I W station of 1908 and 1916 On hill called Ichimbia, east of city, about 600 yards (0 5 km) northeast along top of hill by road from large house of Antonio Herrera formerly owned by Julio Teran, at highest point of road and near remains of some old mud pillars, 20 feet (6 meters) east from only pillar remaining on east side of road True bearings pillar on hill, 64° 17′ 3, spire on Santo Domingo church, 89° 22′ 4, waterfall across valley, 118° 21′ 8, right edge of small house on hill, 337° 18′ 4

In 1926 station *A* was closely reoccupied, exact reoccupation being impossible, since the station was not marked in 1924 and the mud pillars have disappeared Owing to poor visibility the marks used in 1924 could not be seen Station was marked by cross in stone set flush with ground. True bearings center of power-line structure on hill, 4 miles (6 km), 0° 32′ 1, monument on hill, 4 miles (6 km), 91° 48′ 7, right edge of small house on hill, 3 miles, (4 8 km), 342° 18′ 6

Station *B* is about 2 miles (3 2 km) west of station *A*, on grounds of "Escuela de Artes y Officios" 3 7 meters south of edge of bank of ravine across from prison and north of "Escuela de Carpinteria," northeast of foot of wall of old reservoir, marked by concrete post 30 inches (76 cm) long and 10 inches (25 cm) square, lettered "C I W 1924," extending 2 inches (5 cm) above ground, exact point marked by cross. True bearings monument on hill, 92° 43′ 9, lightning-rod on tower of prison, 188° 29′ 8, right edge of house on hill east of prison, 233° 26′ 0, San Roque church, 286° 54′ 6, Santo Domingo church, 299° 13′ 3.

Riobamba, Chimborazo, 1924—Three stations were occupied. Station *A* is probably an exact reoccupation of C.I W. station of 1916. On highest point of a small unnamed hill, about 1,800 feet (550 meters) northwest from water-tanks located on a hill called Cerro (or Loma) del Quito, about one-half mile (0.8 km) northwest of railroad station, 24 2 meters northeast of a large boulder and 17 2 meters east of a smaller boulder; marked by a marble-topped concrete monument, 3 feet (0 91 meter) long and 8 inches (20 cm) square, reinforced with copper wire, projecting slightly above ground and lettered "C.I.W. 1916," exact point marked by a cross True bearings. gable of distant house, 16° 50′ 5, east cross on Mount Cualacal, 63° 30′ 0, spire of San Alfonso Church, 309° 52′ 2, left-edge of water-tank, 312° 08′ 4; cathedral tower, 314° 26′ 9

Station *B* is about 1,500 feet (0 5 km) south from station *A*, on municipal property, about 1,000 feet

SOUTH AMERICA

Ecuador—*concluded*

Riobamba, Chimborazo, 1924—continued

(0 3 km) northwest of Hotel Metropolitano and 84 4 feet (25 7 meters) southeast from Meteorological Observatory, about 12 feet (3 7 meters) south of road leading from gate of grounds to observatory, 80 paces from gate and in line between the south corner of observatory and flagstaff used as mark, marked by marble-topped concrete post, 3 feet (0 91 meter) long and 8 inches (20 cm) square, set almost flush with ground, lettered "C I W 1924," exact point marked by cross True bearings right edge of right water-tank, 243° 29′ 3, flagpole on residence, 297° 49′ 4

Station *C* is 155 9 feet (47 52 meters) southwest of station *B*, nearly on line through station *B* to right edge of right water-tank whose true bearing is 243° 28′ 6

Guiana

Bartica, British Guiana, 1923—Near hospital landing at junction of Essequibo and Mazaruni rivers, about 60 feet (18 meters) northeast of station of 1908, nearly in line of extension northward of street passing hotel between rows of mango trees, 14 feet (4 3 meters) south of large mango stump on river bank, 15 feet (4 6 meters) north of edge of street at point west of bend and about 24 feet (7 3 meters) east of intersection of street passing hospital, marked by cross in granite stone bearing letters "C I 23" True bearings right gable of south part of hospital, 51° 00′ 0, east gable of cottage, 99° 16′ 8, right gable of house across Essequibo River, 1 5 miles (2 4 km), 203° 59′ 0

Cayenne, French Guiana, 1923—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1908 and 1918 In public roadway south of Botanical Gardens in eastern part of town, 236 meters south of south garden gate, 10 feet (3 meters) east and 31 5 feet (9 6 meters) west of edges of ditches beside roadway, nearly in line between two meridian monuments, each about 42 by 42 centimeters, and 45 centimeters high, 29 58 and 26 18 meters from north and south monuments respectively, marked by copper rod 1 5 centimeters in diameter, projecting 1 centimeter from center of concrete slab 1 54 meters square True bearings hole in south meridian monument, 0° 03′ 7, east side of east gate-post at south entrance to Botanical Gardens, 167° 05′ 5, hole in north meridian monument, 179° 55′ 9, center of westerly gate-post at southeast corner of Botanical Gardens, 206° 29′ 5

Station *B* is 83 0 feet (25 30 meters) south of station *A*, in direct line with station *A* and east edge of east pillar of south garden gate, and 18 6 feet (5 67 meters) east of square concrete post across ditch True bearings west edge of west leg of wireless tower, 161° 19′ 8, east edge of east pillar of south garden gate, 167° 05′ 9

Georgetown, British Guiana, 1923—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1918, in grounds belonging to and south of Botanical Gardens, near center of former D'Urban race-course, 36 meters north of drainage canal along inside of course in old graded roadway which crossed course at right angles, 50 0 meters north of wire fence along south side of field, 17 meters west of fence which crosses field from north to south, about 4 meters west of ditch along east side of roadway, marked by concrete block 6 by 6 by 24 inches (15 by 15 by 61 cm) projecting

SOUTH AMERICA

GUIANA—*continued*

Georgetown, British Guiana, 1923—continued slightly above ground and lettered "C I W 1918," on top True bearings base of wind-vane pole on office, 128° 38′.6, ball on lower wind-vane, 128° 59′.6, ventilator on west end of Queen's College, 284° 20′.6

Station *B* is about 850 feet (259 meters) northwest of station *A* and about 300 feet (91 meters) southeast of C I W station of 1913, east of superintendent's house, near eastern end of small inclosure used as pasture lot, 32.5 feet (9.9 meters) from hedge to north, 56.8 feet (17.3 meters) from hedge to east, and 81.4 feet (24.81 meters) southeast of gate-post at entrance to lot, marked by hexagonal granite stone about 8 inches (20 cm) in diameter and 3.5 feet (1.07 meters) long, projecting about 6 inches (15 cm) above ground, and lettered "C.I", a cross near center marking exact spot True bearings east gable of superintendent's house, 102° 46′.7, center of anemometer support on Botanical Building, 106° 05′.3, ball below weather-vane on botanical building, 106° 28′.1

New Amsterdam, British Guiana, 1923—Exact reoccupation of C.I.W station of 1908 and 1918, north of city, on grounds of lunatic asylum, near northeast corner of large quadrangle used as playground and athletic field, 110 feet (33.5 meters) northwest of nearest corner of superintendent's residence, 71.4 feet (21.76 meters) south-southeast of a 28-inch (71-cm) tree, 45.3 feet (13.81 meters) southwest of a 20-inch (51-cm) tree at corner of tract, and 91.5 feet (27.89 meters) nearly due north of 28-inch (71-cm) tree opposite driveway to superintendent's residence across road, marked by a 3-inch (8-cm) brass screw near center of wooden post 6 by 6 by 24 inches (15 by 15 by 61 cm) set flush with ground True bearings tip of water-tank left of east end of stockade, 23° 45′.4, northeast corner of stockade, 25° 03′.4, outer corner of northwest foundation pier of Victoria block, 72° 16′.4, tip of square ventilating cupola on A block, 76° 33′.8, tip of hexagonal cupola on C block, 83° 30′.6.

Onverwacht, Dutch Guiana, 1923—Close reoccupation of C I W station of 1908, at village on railway, about 30 kilometers south from Paramaribo station, 4 feet (1.2 meters) south of path to cemetery running north at right angles to main path with turnstile at entrance leading westward from store, 82 feet (25.0 meters) north of main path, and 18 feet (5.5 meters) south of edge of forest, marked by large bottle set neck-up somewhat below surface, also by hardwood stake projecting about 1 foot (0.3 meter) above ground, 8 inches (20 cm) from station True bearings spire of church with wind-vane, 311° 56′.0, spire of church with cross, 322° 36′.2

Paramaribo, Dutch Guiana, 1923—Two stations, *A* and *C*, were occupied Station *A* is an exact reoccupation of C I W station of 1908 and station *A* of 1918, near river, east of city, on tract of ground formerly used as cricket-field, 12 feet (3.7 meters) south of edge of ditch along north boundary of field, 10.8 feet (3.29 meters) from center of reference stone 23 inches (58 cm) long, projecting about 5 inches (13 cm) above ground, set at ditch bank, 35 feet (10.7 meters) from center of embankment between two ditches, measured from point 124 feet (37.8 meters) west of nearer of two royal palm trees growing on center embankment, and 216 feet (65.8 meters) east of nearer of two canal gates, marked by original hardwood post, 6 by 6 by 24 inches (15 by 15 by 61 cm) set flush with ground, a brass bolt in top marking exact spot True bearings east gable of public works building, 53° 52′.1, left spire of Catholic church, 86° 03′.7, right spire of Catholic church, 86° 32′.7, south gable of district commissary, 95° 07′.7, station *C*, 326° 02′.3

Station *C* is 211.8 feet (64.55 meters) southeast of station *A*, and 33 feet (10.1 meters) north of bridge crossing ditch, marked by large granite rock set flush with ground and lettered "C I", a cross marking exact point True bearings spire on court-house, 74° 17′.8, left gable of commissary, 114° 09′.5

St Laurent, French Guiana, 1923—Two stations were occupied Station *A* is in plot of ground used as athletic field in eastern part of village, on extension of center-line of Rue Marceau, west of hedge of bamboo behind which runs a light tramway for push cars, 134.1 feet (40.87 meters) southeast of iron lamp-post set in concrete base, standing in center terminus of street, and 34.2 feet (10.42 meters) southwest of westerly football goal-post at southerly end of field, marked by granite stone about 24 inches (61 cm.) long and about 7 inches (18 cm) square, set flush with ground and lettered "C I" True bearings ornament at east gable of small house, 54° 19′.9, ball at base of cross on Catholic church, 192° 39′.9, ornament at east gable of Mr Gougis' residence, 205° 55′.7

Station *B* is 177.7 feet (54.16 meters) south of station *A*, in direct line with station *A* and east ornament on roof of Mr Gougis' house, and 74.8 feet (22.80 meters) north of barbed-wire fence running east and west; marked by granite stone 24 by 6 by 18 inches (61 by 15 by 46 cm), lettered "C.I," exact point indicated by cross True bearings east gable of market building, 184° 46′.5, west ornament of Mr Gougis' house, 204° 41′.0, east ornament of Mr. Gougis' house, 205° 55′.0

SOUTH AMERICA

GUIANA—*concluded*

PARAGUAY

Concepcion, 1925—Two stations were occupied Station *A* is a practical reoccupation of C I.W station of 1913, on waste land east of town, about one-third mile (0.5 km) northeast of church, 65.3 meters southeast of southeast corner of fence inclosing small lot (north lot of two), 38.3 meters northeast and 2.8 meters south of two small trees respectively, marked by bone projecting 2 inches (5 cm) above ground True bearings spike on left end of large building, 54° 09′.8, left edge of church steeple, 57° 42′.2, left edge of native house, 200 meters, 90° 19′.0

Station *B* is 90.8 meters east of *A*, 22.6 meters north of a wire fence, and 8.0 meters north-northwest of a dead tree-trunk, marked by bone projecting 1 inch (2.5 cm) above ground True bearings spike on left end of large building, 64° 01′.0; left edge of church spire, 65° 17′.3, left edge of native house, 100° 10′.8, station *A*, 112° 38′.6

San Salvador, Alto Paraguay, 1925—On ground formerly used as meat-packing plant of Armour Company, three-fourths mile (1.2 km), east of Paraguay River, on hill about one-half mile (0.8 km) east of buildings of old packing plant, 42.2 meters northeast of northwest corner of fence inclosing manager's house, and 7.4 meters south of wooden electric-light pole, marked by peg True bearings lightning-rod on tall chimney, one-half mile (0.8 km) 99° 32′.9, center edge of water-tank, one-half mile (0.8 km),

SOUTH AMERICA

PARAGUAY—*concluded*

San Salvador, Alto Paraguay, 1925—continued 121° 55′ 0, lightning-rod on large building, one-eighth mile (0.2 km), 355° 32′ 8

Trinidad (Asuncion), 1925—Probably about 50 meters southeast of C I W station of 1913, in Trinidad, a suburb of Asuncion, near top of small hill in field of Botanical Gardens, north of path leading from railroad station to home of director, practically in line between two tall palm trees, 9 3 meters southeast of one and 20 4 meters northwest of the other, and 77 paces southeast of corner of cement house, marked by cross in rough native stone projecting 4 inches (10 2 cm) above ground Former station could not be reoccupied, due to construction of cement house nearby True bearings right edge of red-roofed house, 5 miles (8 km), 64° 33′ 4, chimney of house, 600 meters, 161° 22′ 9, windmill, 3 miles (5 km), 307° 40′ 2

PERU

Arequipa, Arequipa, 1923, 1924, 1926—Two stations, *A* and *B* of 1912 and 1917, were reoccupied in northeast part of grounds of Arequipa branch of Harvard Astronomical Observatory, about 5 kilometers northeast of Arequipa Station *A* is 10 67 meters and 19 5 meters from north wall and east wall respectively, 19.24 meters northeast of northeast corner of building over 13-inch telescope, and 24 4 meters north of northeast corner of transit room, marked by deep cross in limestone rock about 16 inches (41 cm) square and 7 inches (18 cm) thick, buried about 16 inches (41 cm) below surface of cultivated garden True bearings right spire of Caima church, 31° 35′ 1, tip of dome of smaller church, 39° 35′ 9, spire of Pancarpata church, 332° 54′ 8

Station *B* is 15.2 meters east of station *A*, in northeast corner of inclosure, 4 1 meters from north wall, and 4 75 meters from east wall, marked by limestone post 6 by 6 by 14 inches (15 by 15 by 36 cm), set so that the top is about 14 inches (36 cm) below surface of cultivated garden, a cross marking exact spot True bearings tip of dome of small church in Arequipa, 39° 44′ 3, spire of church across valley, 333° 01′ 7, ball on tower of house in valley, 336° 35′ 5, church spire in Carmen Alto, 358° 32′ 6

In 1926 two new stations designated *C* and *D* were established Station *C* is southeast of stations *A* and *B* on grounds of the Arequipa Golf Club, east of main part of city, 30 meters east of cliff edge at river bank, and 60 meters north of the southwest corner of club-house This station was not completely occupied and was abandoned owing to prospective construction of high-voltage power-line nearby True bearings southwest corner of club-house, 13° 30′ 4, church spire in Arequipa, 44° 45′ 2, church spire in Arequipa, 71° 41′ 6, southwest corner of director's residence at Harvard Observatory, 163° 23′ 6

Station *D* is in an open cultivated field about 5 kilometers southeast of observatory, and about 1 kilometer southeast of *C*, nearly in line with stations *A* and *C*, about 275 meters north of a dry river bed, 58 0 meters north of a one-story stone house, and 3 meters east of an irrigation ditch, marked by brass tack in peg driven flush with ground True bearings Yanaguara church spire, 2 miles (3.2 km), 103° 22′.5, southwest corner of director's residence at Harvard Observatory, 162° 34′ 1, right spire of San Antonio Church at Miraflores, 2 miles (3 2 km), 308° 22′ 1

SOUTH AMERICA

PERU—*continued*

Chimboté de Amazonas, Loreto, 1924—On south bank of Amazon River, at cattle ranch and wood station for river steamer, on highest point of hill on which ranch house is located, and about 150 feet (46 meters) east of house

Huancayo Observatory, 1921-1926—Absolute observations for control of magnetograph records have been made weekly at the regular observing-piers of the observatory since its completion in 1922, prior to which occasional observations were made in a small building called "Frame" Occasional observations have also been made by field observers of the Department who have visited the observatory for the purpose of making comparison of instruments A full description of the observatory will appear with the publication of the magnetograph results

Iquitos, Loreto, 1924—Proximate reoccupation of C I W station of 1910 Two stations were occupied on football-field in southwest corner of Plaza 28 de Julho Station *A* is 119 3 feet (36 36 meters) north from doorsill of only brick house in vicinity, 60 paces northwest from white stone public toilet house, 306 feet (93 3 meters) west from lamp-post, which is almost in direct range with ball on monument in northeast corner of plaza, marked by concrete block 8 by 8 inches (20 by 20 cm) on top, lettered "C I W 1924," exact point marked by brass rifle shell True bearings cross on church, 228° 37′ 6, ball on monument, 265° 09′ 1

Station *B* is 271 7 feet (82 82 meters) from station *A* and in direct line to ball on monument, 34 feet (10 4 meters) west of lamp-post nearly in line with monument, marked by concrete block, 7 by 7 inches (18 by 18 cm) on top, exact point marked by brass rifle shell

Juliaca, Puno, 1923, 1924, 1926—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1912 and 1917, in the pampa, one-half mile (0 8 km) southwest of town, in line with inner edge of west wall and 42 0 feet (12 80 meters) north of north wall of ruins of old mud and stone house, and 66 paces east of edge of road running along west side of pampa, marked by stone 8 by 8 by 20 inches (20 by 20 by 51 cm), set so as to project about 1 inch (3 cm) above ground, a cross marking exact spot True bearings tip of water-tank at railroad yards, 216° 19′ 4, gable over entrance to tennis-club grounds, 217° 50′ 0, cross on La Merced Church, 223° 19′ 0, northeast corner porch-post at extreme left of residence, 273° 01′ 8

Station *B* is 265 3 feet (80 86 meters) southwest of station *A* in direct line from cross on La Merced Church through station *A*, marked by rough stone about 18 inches (46 cm) long set so as to project about 2 inches (5 cm) above surface, a cross marking exact spot True bearings tip of water-tank at railroad yards, 217° 08′ 4, gable over entrance to tennis-club grounds, 219° 08′ 4, cross on La Merced Church, 223° 19′ 0, corner porch-post at extreme left of residence, 266° 31′ 2

La Merced, Junin, 1924—Two stations were occupied Station *A* is a close reoccupation of C I W station of 1912, in a cornfield between town and river, two streets east of main street of town, on a high bank, above river, about 300 yards (274 meters) east of church, 200 yards (183 meters) north-northeast of building of Sociedad Filarmonica, and about 50 feet (15 meters) west of edge of bluff, marked by concrete block about 12 inches (30 cm) square and set 6 inches (15 cm) below surface True bearings

SOUTH AMERICA

PERU—*continued*

La Merced, Junin, 1924—continued
northeast corner of Filarmonica building, 32° 17'.3, northwest corner of Dr Pinto's house, 71° 30'.1
Station *B* is a close reoccupation of the 1912 dip station, in front and 52 feet (15.8 meters) from the door of old Filarmonica building, forming north apex of a triangle with third and fourth trees along lane leading from building, being 12 feet (3.7 meters) from each tree, marked by concrete block 8 inches (20 cm) square, lettered "C.I.W. 1924," exact point being marked by bottle-neck embedded in concrete. True bearing: northeast corner of church just above stone foundation, 159° 57'.4.

Lima, Lima, 1924—Two stations were occupied. Station *D* is a close reoccupation of C. I. W. station *B* of 1918, inside of race-course or hipodromo of Jockey Club of Lima about 2.5 kilometers southwest of palace, 120 meters south of grand-stand, and 48.0 meters south of finishing-post on race-track, marked by brass rod in middle of cylindrical concrete monument which is 18 inches (46 cm) in diameter and 2.5 feet (0.76 meters) long set flush with ground. True bearings: cross on church dome, three-fourths mile (1.2 km), 127° 12'.6, flagpole on pavilion, 200 meters, 199° 19'.7, wireless tower, 5 miles (8 km), 215° 07'.7, left spike on Spanish Arch, one-half mile (0.8 km), 235° 46'.5.
Station *E* is a close reoccupation of C. I. W. station *C* of 1918, 48.77 meters southwest of *D*, and 44.9 meters northwest of center of flower garden, marked by brass rod in concrete as at *A*. True bearings: cross on church dome, 131° 51'.8, flagpole on pavilion, 202° 51'.7, wireless tower, 215° 09'.4.

Mollendo, Arequipa, 1924—Two stations were occupied. Station *A* is a close reoccupation of C. I. W. 1917 station, one-half mile (0.8 km) north of dock, one-eighth mile (0.2 km) west of main street, south of town cemetery. It is slightly west of line of southeast fence of cemetery, 83.6 feet (25.48 meters) south of southeast corner of cemetery, and 195.0 feet (59.44 meters) northwest of stone inclosure, marked by bottle buried 6 inches (15 cm) below ground. True bearings: cross on hill, 1 mile (1.6 km), 149° 08'.4, spike on red roof, three-fourths mile (1.2 km), 216° 15'.5, left spire of church, 1 mile (1.6 km), 322° 38'.4.
Station *B* is 402 feet (122.5 meters) west of *A* and 130 feet (39.6 meters) south of southwest corner of cemetery, marked by bottle buried 6 inches (15 cm) below ground. True bearings: cross on hill, 155° 01'.9, left spire of church, 318° 11'.1.

Paita, Piura, 1924—Exact reoccupation of C. I. W. station of 1912. On bluff east of town, on town side of new cemetery on bank of deep gully, 486 feet (148.1 meters) southwest of northwest corner of cemetery and 2.7 feet (0.82 meter) northwest of point in line with northwest wall of cemetery, marked by cross cut in boulder 7 inches (18 cm) in diameter and projecting 3 inches (8 cm) above ground. True bearings (1912 values): base of cross on plain, 10° 06'.3, flagpole on custom-house, 105° 17'.7, center of cross over cemetery gate, 268° 59'.8.

Piura, Piura, 1924—Two stations were occupied. Station *A* is a close reoccupation of C. I. W. station of 1912, in middle of dry bed of Piura River, about one-fourth mile (0.4 km) north of bridge and opposite largest of group of three houses on west bank of river. True bearing: light-post at west end of bridge, 8° 03'.5.
Station *B* is about three-fourths mile (1.2 km) northwest of station *A*, southwest of railway station and directly south from wireless tower, at edge of bushy scrub, in line with west fence around railway yards and 244.7 feet (74.58 meters) south from concrete base of wireless tower, marked by concrete post one meter long, 30 centimeters square, and extending 20 centimeters above ground, lettered "C. I. W. 1924," exact point marked by a cross. True bearings: point of ornament on north ventilator, Marconi office, 33° 07'.6, base of cross on watch-tower half mile (0.8 km) west of town, 90° 53'.3, head of nearest angel with trumpet on church tower, 273° 52'.2.

SOUTH AMERICA

PERU—*concluded*

Puerto Bermudez, Junin, 1924—Two stations were occupied. Station *A* is a close reoccupation of C. I. W. station of 1912, on top of high bank on west side of Pichis River, about one-third mile (0.5 km) from wireless station, 50 yards (45.7 meters) northeast of northeast corner of remains of old house of Gumercindo Rivero. This location is up river a short distance from buildings of present Rivero plantation and about half mile (0.8 km) north of station *B*.
Station *B* is on west bank of Pichis River near mouth of small creek which joins river about 600 feet (183 meters) above wireless station, almost in front of building formerly used as a government commissary, 66 feet (20 meters) from north end of a section of stone paving and 12 feet (3.7 meters) toward river from edge of paving, marked by granite stone about 10 inches (25 cm) square and about same in depth set slightly below surface, lettered "C. I. W. 1924." True bearings: left edge at bottom of top section of southwest wireless mast, 95° 44'.6, center of east leg at bottom section of north wireless mast, 135° 29'.0.

Quebrada Puma Yaca, Loreto, 1924—On right bank of Pachitea River, about 15 miles (24 km) below Puerto Leguia, on gravel beach, about 150 feet (46 meters) down-stream from mouth of a creek called Quebrada Puma Yaca.

San Lorenzo Island (Callao Harbor), Lima, 1924—About 60 feet (18 meters) north of C. I. W. station of 1908, 1912, and 1914, on small bay formed by a rocky point, near building marked "Deposito de explosivos," directly in front of door of underground magazine, about 10 feet (3 meters) from edge of water at high tide, and 20 feet (6.1 meters) from edge of road. True bearings: flagpole on Caleta Paraiso, 325° 17'.7.

Tarma, Junin, 1924—Close reoccupation of C. I. W. station of 1912. South-southeast of town on slightly rising ground near base of mountain, about one-fourth mile (0.4 km) south-southeast from cathedral, and 31 feet (9.4 meters) from large painted cross, marked by concrete block about 8 inches (20 cm) square, cross in the center marks exact point. True bearing: cross on cathedral, 164° 12'.5.

URUGUAY

Colon, Colegio Pio, Montevideo, 1925—Two stations were occupied. Station *A* is a close reoccupation of C. I. W. station of 1913 and 1919, on grounds of Colegio Pio, in path between cultivated fields, 56.2 meters south of center of doorway of old astronomical observatory building, 38.0 meters southeast of east corner of small brick building, 43 meters northwest of telephone-post standing 7.1 meters from wire

SOUTH AMERICA

URUGUAY—*concluded*

Colon, Colegio Pio, Montevideo, 1925—continued fence, marked by peg True bearings spire on college chapel, 221° 26′ 7, right edge of brick building, 264° 31′ 9, left side of telephone-pole, near base, 321° 23′ 3

Station *B* is about 90 meters northwest of *A*, 46 0 meters northwest of north corner of small brick building, and in center of footpath between cultivated fields, marked by peg True bearings spire on college chapel, 232° 22′ 7, right edge of small brick building, 291° 58′ 0, left edge of telephone-pole, 319° 06′ 8

VENEZUELA

Barcelona, Anzoategui, 1923—Two stations were occupied Station *A* is close reoccupation of C I W station of 1913, in northwestern part of town, about 6 blocks north and 2 blocks west of northwest corner of main plaza, in direct line of row of houses True bearings cross on lone house, 126° 48′ 1, left tower of twin towers, 303° 49′ 4, right tower, 304° 30′ 2

Station *B* is about one-half mile (0 8 km) northwest of main plaza and about one-fourth mile (0 4 km) northwest of hospital and ruins of old fort, 250 paces northwest of station *A*, 760 4 feet (231 77 meters) southeast of lone house and almost in line with front line of house extended, and about 20 paces northeast of edge of cactus jungle, marked by tapering hardwood stake 28 inches (71 cm) long, 3 inches (8 cm) in diameter at lower end, set with large end down, top projecting about 5 inches (13 cm) above ground, a brass screw marking exact point True bearings cross on house, 133° 12′ 8, left tower of twin towers, 302° 54′ 0, right tower, 303° 24′ 8, tip of tower of church at main plaza, 320° 41′ 8

Barquisimeto, Lara, 1922—Close reoccupation of C I W station of 1912, about three-fourths kilometer north-northeast of church, on first elevated ground beyond edge of town, 37 meters east of easterly edge of small stone quarry, 26 meters east of easterly edge of smaller excavation, 97 paces east of road passing just west of quarry, 7 2 meters south-southwest of nearly buried fragment of petrified tree and 4 meters west of center of depression which is 5 meters south of approximate center of piece of petrified tree, marked by fragment of hard stone about 36 centimeters long, projecting about 5 centimeters above ground, a notch in sharp upper edge marking exact point True bearings head of statue on left of two similar domes, 7° 20′ 1, knob on right dome, 7° 43′ 9, tip of dome seen just to left of right wireless tower, 19° 17′ 0, tip of dome of San Juan Church, 42° 27′ 0, base of cross on monument, 309° 08′ 8, spire of small church, 355° 05′ 2

Caracas, Federal District, 1922—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1905, 1912, 1913, and 1914, on same hill as observatory, 63 2 feet (19 26 meters) northeast of northeast corner of observatory, 33 6 feet (10 24 meters) northeast of center of round instrument-pier, 43 feet (13 1 meters) east of center of large boulder, and 49 feet (14 9 meters) southeast of center of large rectangular pier, marked by hole in top of marble post 3 5 by 6 by 27 inches (9 by 15 by 69 cm) projecting about 2 inches (5 cm) above ground and lettered on top "C I 1905" True bearings apex of gateway to large inclosure, 175° 02′ 8, east spire of Pantheon Nacional, 240° 14′ 8, clock tower facing Bolivar Square, 259° 48′ 3, south spire of church in eastern edge of city, 268° 42′ 5

SOUTH AMERICA

VENEZUELA—*continued*

Caracas, Federal District, 1922—continued

Station *B* is on observatory grounds, about 300 feet (91 meters) southwest of station *A*, on low hilltop, 193 0 feet (58.83 meters) west of southwest corner of observatory, 54 0 feet (16 46 meters) southeast of telephone-pole 32 feet (9 8 meters) from edge of road embankment to north, and 20 feet (6 1 meters) from edge of road embankment to south, marked by rough stone about 4 by 8 by 24 inches (10 by 20 by 61 cm), projecting about 2 inches (5 cm) above surface, a cross near center marking exact point True bearings spire of small church, 138° 10′ 2, apex of gateway to large inclosure, 177° 12′ 4, spire of church just south of capitol building, 264° 32′ 0, north spire of large church in eastern part of city, 267° 31′ 8, south spire of large church in eastern part of city, 267° 42′ 2

Carupano, Sucre, 1923—Exact reoccupation of C I W station of 1913, west of central part of town, 190 feet (57 9 meters) southwest of southeast corner of cemetery, and 128 feet (39 0 meters) south of south wall of cemetery, measured from junction with stone partition wall, marked by large angular stone about 26 inches (66 cm) long, projecting 4 inches (10 cm) above ground, notch in sharp upper edge marking exact spot True bearings base of cross over cemetery gateway, 175° 39′ 0, ball at top of lighthouse, 182° 52′ 0

Castilletes, Guajira, 1926—On western shore of entrance to lagoon, on an area free from undergrowth, about 150 yards (137 meters) south-southeast from tide-gage house of Caribbean Petroleum Company, marked by brass screw in top of cement marker and witnessed by a timber 2 by 4 inches (5 by 10 cm) about 10 paces due south True bearings stake on hill across lagoon, about 1 5 miles (2 4 km), 137° 18′ 0, peak "Nellite" in highest visible range, 177° 51′ 7, signal in Castilletes village, 230° 27′ 5

Ciudad Bolivar, Bolivar, 1923—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1913 On north side of Orinoco River in State of Bermudez almost directly across from central part of city, near second group of large boulders below village of Soledad, 40 1 feet (12 22 meters) north of deep cross cut in top of boulder about 12 feet (4 meters) long, extending about 4 feet (1 2 meter) out of ground, of lighter color than others in group, this cross being in range between station and cross on church, marked by granite stone 3 by 8 by 26 inches (8 by 20 by 66 cm) lettered "C I", with cross at center, set so as to project about 1 inch (3 cm) above ground, and with much larger end down True bearings flagstaff at corner of government building at Bolivar Square, 1° 28′ 4, short standard at top of telegraph tower on south side of river, 11° 22′ 0, short standard at top of telegraph tower on small island near middle of river, 42° 35′ 1, cross on tower of Catholic church, 355° 29′ 6

Station *B* is near bank of river, 75 feet (22 9 meters) directly west of station *A*, about 40 feet (12 meters) southeast of shed, marked by granite stone about 8 by 10 inches (20 by 25 cm) on top, projecting 1 inch (3 cm) from ground, and lettered "C I '23," a cross marking exact point True bearings top point of telegraph tower west of church, 10° 01′ 3, top of cross on tower of Catholic church, 354° 22′ 2

Isla Pajaro, Zulia, 1922—On small uninhabited island, about 150 meters long, 25 meters wide, rising 3 or 4

SOUTH AMERICA

VENEZUELA—*concluded*

Isla Pajaro, Zulia, 1922—continued meters above level of lake, about 9 kilometers southeast of Maracaibo, near opposite shore and about 1 kilometer southeast of Isla Providencia on which leper colony is isolated, at a point on island 58 5 meters from southern end, 17 meters from easterly side, and 7 meters from westerly side, marked by post 56 centimeters long and 9 centimeters in diameter, a small copper nail marking exact spot True bearings left tower of cathedral, 122° 12′ 6, right tower of cathedral, 122° 20′ 3, tall church-steeple in Maracaibo, 123° 24′ 6, tip of octagonal cathedral-tower in Maracaibo, 124° 39′ 2, tip of tower at leper colony on Isla Providencia, 159° 13′ 0

La Ceiba, Trujillo, 1922—About 350 meters south of railway station, near shore of lake, 30 0 meters south of crooked palm tree, about 25 meters south of C I W station of 1912 The general location is unsuited for a permanent station

Maracaibo, Zulia, 1922—Close reoccupation of C I W station of 1912, on government land, in plain northwest of town, about 3 kilometers from wharf end of tram-line, about 180 meters at right angles northeast from tram-line at only cut between Maracaibo and Bella Vista, east of wide sandy trails, 39 50 meters east of fence-line across sandy road, and 27 0 meters south of thorny tree, marked by hardwood stake True bearings center of windmill, 73° 39′ 5, central main casting on windmill, 181° 27′ 2

See also Isla Pajaro

Puerto Cabello, Carabobo, 1922—Close reoccupation of C I W station of 1912, south of town in line with front wall of cemetery and 183 76 meters east of its northeast corner, and 23 meters west of southwest corner of shack inclosure formed by rough, split bamboo palings, marked by stone about 5 by 25 by 50 centimeters, projecting about 5 centimeters above surface of ground True bearings flagpole on fort on hill, 80° 42′ 7, base of pole on far end of meat cannery, 197° 41′ 9, base of pole on near end of meat cannery, 199° 29′ 7, base of pole on northwest corner of new part of cannery, 199° 58′ 9

Soledad, Bermudez, 1923—See Ciudad Bolivar

Zapara Island, Maracaibo, 1926—Near fishing village on west side of Zapara Island which is about 3 miles (4 8 km) southeast of east end of San Carlos Island, about 300 yards (274 meters) from west shore of island, marked by cement post True bearings left edge of Pescadores Island, 13° 34′ 6, cross on Taos Island, 74° 39′ 1, native shack at head of lagoon, 151° 43′ 8, blazed tree 60 paces west of lagoon, 213° 37′ 1

ISLANDS, ATLANTIC OCEAN

AZORES

Angra, Terceira, 1925—Observations were made on the non-magnetic pillar established by the Meteorological Service, on grounds of old Fort Sebastian, about 0 5 kilometer east of Angra, in front center of inclosure, about 10 meters from sea wall and about 15 meters from building on inland side True bearings top seaward edge of lighthouse across harbor, 26° 44′ 3, geodetic marker on Monte Brazil, 40° 17′ 2

Horta, Fayal, 1925—The magnetic observation pillar on grounds of Meteorological Observatory at Horta was occupied, about 30 meters east of north end of observatory and about 10 meters northeast of La

ISLANDS, ATLANTIC OCEAN

AZORES—*continued*

Horta, Fayal, 1925—continued Place pillar It is of marble and unlettered True bearing clock tower, 192° 31′ 1

Ponta Delgada, San Miguel, 1925—Observations were made on pillars established by Colonel C A Chaves, director of Meteorological Service of the Azores, within walled inclosure at rear of his residence Station *A* is a pillar 5 2 meters from south wall of garden built for azimuth and magnetometer observations True bearings mean of two crosses on near low wall of garden, 159° 59′ 0 (These two crosses represent the line of collimation with vertical circle right and left respectively of instrument used by Colonel Chaves, when sighted on the mark on distant mountain, too high to be observed with magnetometer telescope, and often obscured by fog)

Station *A* + 7 is station *A* with a block placed on the top to raise observer's instrument 7 centimeters to the height of the instrument of Colonel Chaves on the same pier, because of intense local disturbance

Station *AA* is pier within non-magnetic hut, 11 4 meters east of station *A*, 6 3 meters from east wall and 6 9 meters from south wall of garden

Ponta Delgada, C, San Miguel, 1925—Reoccupation of pillar erected by Colonel C A Chaves, director of Meteorological Service of Azores, and called Pico do Vigario, about 10 kilometers along road northwest from city, near southwest corner of pasture about 0 8 kilometer along unimproved road north of main road, about 0 25 kilometer east of British wireless station, 25 meters southeast of wall along road and 10 meters northeast of ditch along southwest side of pasture A block 7 8 centimeters thick was placed on pillar to raise instrument to same height as that used by the Meteorological Service True bearings northwest corner of dwelling at wireless station, 78° 38′ 0, marker on Pico do Vigario, 185° 25′ 7

Ponta Delgada, Observatory, 1925—Observations were made on grounds of Magnetic and Seismological Observatory of San Miguel The exterior pillar of observatory has been designated station *B*, and is on observatory grounds, 6 kilometers north of city on plateau known as Faija de Cima, south of path leading from residence to absolute house, 50 97 meters southeast of central pillar of absolute house, and about equally distant from direct-reading and photographic-magnetograph rooms Pillar is of marble, 1 2 meters in height, which was increased by use of block 7 8 centimeters thick to raise C I W magnetometer 26 to height of observatory magnetometer 28 True bearings copper nail in conduit near thermograph building (for use with magnetometer), 177° 31′ 7, geodetic marker on Pico do Arrenegado, 177° 32′ 3

Central Pillar is in absolute house and *Central Pillar* + 7 is the same pillar with block 7 centimeters in thickness to raise magnetometer 26 to same height as that of magnetometer 28 True bearing geodetic marker on Pico do Arrenegado, 180° 38′ 0 (Two crosses on marble tablet in wall about 30 meters distant for use with magnetometers and when distant mark is obscured bear respectively 180° 23′ 0 and 180° 53′ 0, the mean being that of the distant mark)

Earth-Inductor Pier in absolute house was also used for inclination observations during intercomparison of instruments

ISLANDS, ATLANTIC OCEAN

AZORES—*concluded*

Santa Cruz, Flores, 1925—Observations were made on most easterly of three magnetic observing pillars on grounds of Meteorological Observatory, this pillar is of marble and has been designated by the Director of the Meteorological Service as "Pillar *A*," about 40 meters west of wall around observatory building, and about 30 meters south of wall along road leading from town Block of wood 7 8 centimeters thick was used on pier to raise magnetometer 26 to height of that of magnetometer 28 used by Meteorological Service True bearings stone marker of Diabelha, 56° 10′ 3, round knob on chimney top, 250 meters, 79° 07′ 3, stone marker of Fontainhas, 147° 34′ 0

BAHAMAS

Albert Town, Fortune Island, 1922—On rocky point, about 94 5 feet (28 80 meters) northeast of island commissioner's house and about 17 feet (5 meters) southeast of edge of cliff, approximately in center of projection of street running in front of commissioner's house, and about 44 feet (13 meters) northeast of government rain-gage, marked by brass nail in stake driven into crack in natural rock, 1 foot (0 3 meter) beneath surface, the whole being covered by small pile of rocks True bearing small ornament on roof of house across road, 257° 36′ 4

Bight Settlement, Cat Island, 1922—West of roadway in front of commissioner's office and residence, about 60 feet (18 meters) east of tide-water, 26 9 feet (8.20 meters) west of fence along front of grounds and 43 1 feet (13 14 meters) north of nearest edge of heavy concrete base of flagpole standing near entrance upon small wharf almost directly in front of gate leading to commissioner's office, marked by concrete post 6 by 6 inches (15 by 15 cm), lettered "C I W 1922" and set flush with ground True bearings base of cross on small church, 155° 40′ 5, easterly one of two small dormer gables in north side of roof of Otis Young's residence, 316° 46′ 5

Farmer's Cay, Exuma Island, 1922—On grounds of small church on low hill about 100 yards (91 meters) west of beach, near back of lot, 7 8 feet (2 38 meters) north of Australian pine tree, and 37 9 feet (11 55 meters) and 43 7 feet (13 32 meters) from southwest and northwest corner of church respectively, marked by cross cut in natural stone embedded in ground True bearing small ornament on apex of roof of house, about one-eighth mile (0 2 km), 283° 09′ 6

Fresh Creek, Andros Island, 1922—On commissioner's grounds, between ocean and point on roadway about 300 yards (274 meters) up from dock, 35 feet (10 7 meters) north of flagpole, and 9 3 feet (2 84 meters) east of point on line connecting southwest corner of commissioner's residence and northeast corner of jail, 44 1 feet (13 44 meters) from residence and 73 3 feet (22 34 meters) from jail, and 19 2 feet (5 85 meters) east of southeast corner of small concrete structure, marked by limestone block 6 by 8 by 6 inches (15 by 20 by 15 cm), buried with top surface 1 foot (0.3 meter) from surface of ground, a cross marking exact spot True bearings west edge of ruined house, three-fourths mile (2 4 km), 141° 13′ 8, east edge of ruined house, 142° 54′ 0, tip of peaked roofed house, three-fourths mile (2 4 km), 151° 07′ 6

Galloway, Long Island, 1922—On southwesterly side of island, near beach, about 150 yards (137 meters) southeast of stone beacon and post bearing anchorage light at entrance to trail leading across to

ISLANDS, ATLANTIC OCEAN

BAHAMAS—*continued*

Galloway, Long Island, 1922—continued
Clarencetown True bearing light-post at point about 4 feet (1.2 meters) above ground, 126° 58′ 6

George Town, Exuma Island, 1922—In southern corner of irregular-shaped public park, 11 0 feet (3 35 meters) west of almond tree near large cactus hedge, 33 4 feet (10 18 meters) southwest of large pine tree inside of hedge, 49 0 feet (14 94 meters) northeast of almond tree standing by roadway, about 125 feet (38 10 meters) southeast of memorial monument, and about 43 feet (13 meters) from tide-water line, marked by limestone block 6 by 6 by 18 inches (15 by 15 by 46 cm), set flush with ground, center marked by hole True bearings east ornament on roof of town jail, 152° 49′ 3, pyramid-shaped beacon, 2 miles (3 km), 189° 09′ 8

Governor Harbor, Eleuthra Island, 1922—On part of island called "Main," connected by concrete causeway to main part of town which is located on small key, in yard of house owned by Mr Moss, 30 3 feet (9 24 meters) north of gate to street, 31 7 feet (9 66 meters) southeast of west corner of yard, and 43 6 feet (13 29 meters) west of west corner of residence next north of entrance, about equidistant from two landings cut into causeway, about 60 feet (18 meters) back from edge of causeway, 103 5 feet (31 55 meters) northeast of corner of south landing, and 83 1 feet (25 33 meters) southeast of corner of north landing, marked by limestone block, 6 by 6 by 8 inches (15 by 15 by 20 cm), set with top surface about 2 inches (5 cm) below surface, with cross cut one-half inch (1 cm) in top True bearings cross on Episcopal church, 9° 40′ 2, ornament of north end of Hayne's Library, 14° 21′ 1, south gable of Methodist church, 25° 01′ 2, north gable of Methodist church, 26° 38′ 5, gable of Baptist church, 52° 52′ 5, light on point of cay, 62° 11′ 3

Green Cay, 1922—On uninhabited island, about 65 miles 104 6 km) due south of Nassau, about 120 feet (37 meters) in from north side of cay, generally used as anchoring place by hunting parties, about 300 yards (274 meters) east of sand spit projecting about 100 feet (30 meters) into ocean, in low depression about 10 feet (3 meters) deep, running along north side of cay, and about 220 yards (201 meters) northeast of fresh-water well in coral rock formation, marked by bottle buried 6 inches (15 cm) below surface

Nassau, New Providence, 1922—Three stations were occupied Station *A* is about 1 mile (1 6 km) west of Nassau on grounds of Fort Charlotte, 94 6 feet (28 83 meters) south 25° west of tree growing on low retaining-wall, 157 7 feet (48 06 meters) southeast of southeast corner of obelisk west of main fort, marked by granite slab 7 by 10 by 20 inches (18 by 25 by 51 cm) set flush with large surface uppermost and having a cross at center True bearings tip of lighthouse on Hog Island, 204° 15′ 8, flagstaff on Hotel Lucerne, 265° 50′ 6, weather-vane on public library 270° 05′ 4, base of flagpole at Fort Fincastle, 279° 51′ 2,

Station *B* is a secondary station established for observing diurnal variation in declination, in direct line toward lighthouse on Hog Island from station *A* and distant 78 9 feet (24 05 meters)

Station *C* is on Hog Island, a narrow island directly across bay, one-half mile (0.8 km) north of Royal Victoria Hotel in Nassau, about 120 feet (37 meters) from north edge and 80 feet (24 meters) from south edge of island, in natural clearing about

ISLANDS, ATLANTIC OCEAN

BAHAMAS—*concluded*

Nassau, New Providence, 1922—continued
200 feet (61 meters) northwest of southwest boundary post of crown reservation on east end of island, marked by granite block 6 by 12 by 24 inches (15 by 30 by 61 cm) set with top about 6 inches (15 cm) above surface and marked by a cross True bearings base of rod on cupola on Royal Victoria Hotel, 13° 21′ 0, tip of square in masonic emblem on Masonic Temple, 26° 21′ 4, center of top truss on east wireless tower, 59° 04′ 0, tip of obelisk at Fort Charlotte, 65° 48′ 9, base of spire on church steeple, 315° 03′ 4

Port Nelson, Rum Cay, 1922—On public ground, opposite easterly edge of small landing-wharf, about 9 feet (3 meters) east of extension of line lengthwise through center of wharf, 83 0 feet (25 30 meters) northeast of foot of flagpole, and 37 2 feet (11 34 meters) south of edge of drainage canal belonging to salt works, marked by soft limestone rock about 6 by 10 by 18 inches (15 by 25 by 46 cm), set in ground and lettered roughly "C I W 1922" True bearing sign-post near partially completed dwelling about three-fourths mile (1 2 km) distant, 289° 00′ 2

Diurnal-variation observations in declination were made at a secondary station 14 0 feet (4 3 meters) west of primary station on extension of line from sign-post through station

Rock Sound, Eleuthera Island, 1922—In south part of village, near south end of small park adjoining cemetery, about 25 yards (23 meters) east of high-water mark on beach, 33 0 feet (10 06 meters) southeast and 19 8 feet (6 04 meters) northeast respectively of gumalimas trees, and 53 4 feet (16 28 meters) northwest of stone wall at northerly end of cemetery, marked by pint bottle buried with neck just below surface of ground True bearings east gable of pineapple packing house at small wharf, one-fourth mile (0 4 km) 152° 18′ 7

BERMUDA[1]

Agar's Island, Pembroke, 1922—Exact reoccupation of C I W station of 1907 and 1910, on south end of island about 150 feet (46 meters) from western extremity of spur extending westerly toward Two-Rock Passage, about 35 feet (11 meters) from south shore, and about 60 feet (18 meters) from shore of shallow cove north of spur, marked by coral stone, covered over with cement, in which the diagonals are marked, the intersection of the diagonals being the precise point True bearings Gibbs' Hill Lighthouse, 27° 52′ 7, navigation beacon on south side of Two-Rock Passage, 44° 46′ 0, left wireless mast at Daniel's Head, 100° 53′ 5, left clock tower at dock-yard, 146° 52′ 5

Agricultural Station, Paget, 1922—In southern part of public gardens of agricultural station, east of Point Finger Road and south of Main Road, about 1 mile (1 6 km) southeast of Hamilton, south of superintendent's residence and office buildings, 10 feet (3 0 meters) south of edge of cross-road intersecting main drive leading south from offices, 76 5 feet (23 32 meters) west of fence bounding garden on east, northwest of store-house within hedge of high shrubbery, 8 0 feet (2 4 meters) northeast of cedar tree, and 8 4 feet (2 56 meters) southwest of a second

[1] For descriptions of points where secondary observations were made in 1907 and in 1922, see pages 214-224

ISLANDS, ATLANTIC OCEAN

BERMUDA—*continued*

Agricultural Station, Paget, 1922—continued
tree near cross-road True bearings north corner at top of chimney of superintendent's residence, 138° 56′ 1, near corner of farm house, 216° 35′ 5, east corner of same house, 217° 53′ 1, apex of dormer of "Southsea" on south side of Main Road, 358° 00′ 6

Black Bay Southampton, 1922—In an unused roadway which leaves Main Road at foot of first hill west of Black Bay nearly opposite east side of Wilson's Island, and runs eastward nearly parallel with Main Road higher up hillside, about 100 paces west of junction of the two roads, 14 paces east of boundary wall running up hill at right angles, at point where cut for road forms a vertical wall about 11 feet (3 4 meters) high on south side, ground sloping steeply to Main Road about 90 feet (27 4 meters) distant to north and about 20 feet (6 meters) below, it is 19 feet (5 8 meters) from face of this vertical wall measured from point where letters "CIW XXII" were cut in the coral rock toward clock-tower at dock-yard, marked by rough coral stone marked on top with diagonal lines and letters "CIW" True bearings right wireless tower, 147° 13′ 7, left clock-tower at dock-yard, 184° 19′ 3

Ireland Island, Sandy's, 1922—Exact reoccupation of C I W station of 1907 On low flat area called Moresby's Plain, used as a naval recreation ground on western side of island, on a small mound surrounded by an old stone coping originally used as a firing stand in target practice, 51 7 feet (15 76 meters) and 54 3 feet (16 55 meters) respectively from southeast and southwest corners of larger platform marked "911 yards" standing on south bank of small cove, and 71 4 feet (21 76 meters) from north corner of small shelter used as players' club-house on cricket-field True bearings spire of Somerset church, 46° 51′ 8, left wireless mast at Daniel's Head, 59° 52′ 4, right wireless mast, 62° 06′ 4, west corner target bank west of fort, 202° 37′.5, signal mast at fort, 242° 07′ 7, left tangent at top of chimney in dock-yard, 305° 56′ 1

Mont Royal A, Paget, 1922—On vacant lot belonging to Dudley Conyers, east of Mont Royal, which is situated south of Main Road and east of road along boundary between Paget and Warwick parishes, 18 feet (5 5 meters) west of path leading down to Main Road, 48 feet (14 6 meters) east of boundary line of Mont Royal property measured along a line toward Gibbs' Hill Lighthouse, and 56 feet (17 1 meters) from boundary measured toward chimney on north corner of house, marked by hole in top of flat building-stone set flush with surface True bearings spire on A M E chapel, 26° 35′ 1, Gibbs' Hill Lighthouse, 56° 24′ 9, north corner of Mont Royal residence, 92° 35′ 4, right wireless mast, 110° 21′ 3, flagpole near house on small hill, 351° 47′ 6

Mont Royal C, Paget, 1922—On vacant lot between Mont Royal and Mount Pleasant, in Paget West, south of Main Road and just east of road on boundary between Paget and Warwick parishes, in an open space among large trees, 104 feet (31 70 meters) west of Mont Royal *A* measured along line through station *A* to chimney on north corner of house at Mont Royal True bearings Gibbs' Hill Lighthouse, 56° 37′ 2, south edge of chimney on north corner of house at Mont Royal, 89° 23′ 7

Nonsuch Island, St George's, 1922—The coral stone with a group of brass nails to mark center at C I W station of 1907 was not found until after observations

ISLANDS, ATLANTIC OCEAN

BERMUDA—*concluded*

Nonsuch Island, St George's, 1922—continued had been made at a point 15 feet (4 6 meters) southwest On top of ridge about 100 meters west of west building of quarantine hospital, just west of limit of low, dense scrub that covers that portion of island, about 35 feet (10 7 meters) from high, abrupt cliff above shore on north of island, and about 50 meters from shore to south down a more gradual slope, a point 15 feet (4 6 meters) from station on line to gable of woman's ward is 10 feet (3 0 meters) southeast of stone marking station of 1907 True bearings observation tower called "The Peak," 3 miles (4.8 km), 62° 49′ 8, left edge of Martello Tower, 3 miles (4 8 km), 110° 38′ 4, signal mast at Fort George, 3 miles (4 8 km), 156° 14′ 5, peak of roof at woman's ward at hospital, 100 meters, 241° 35′ 8, sharp point near middle of high rock in sea, one-half mile (0 8 km), 345° 59′ 7

St George, St George's, 1922—Probably an exact reoccupation of station of 1907, though coral stone left to mark that station was so badly weathered as to prevent positive identification in a naturally stony soil North of town in unimproved park reserve between poorhouse on west and military barracks on east, within a triangular area bounded on east by road through a deep cut leading directly to town, and two diagonal roads on northwest and southwest which meet the main road north and south of station respectively and intersect between station and poorhouse, it is 26 feet (7 9 meters) west of edge of cut, and 68 feet (20 7 meters) southwest of a boundary stone standing east of road at north end of cut and directly in line past south side of poorhouse to signal mast at Fort George The azimuth line from station to St David's Lighthouse passes over square tower of chapel lower on hillside in north edge of town Marked by a coral stone 6 by 6 inches (15 by 15 cm) covered with cement, having diagonals drawn in top and letters "C IW XXII" True bearings southeast corner of St George Hotel, 4° 44′ 2, south corner of poorhouse, 59° 52′ 6, flagpole at Fort Victoria, 242° 23′ 4, St David's lighthouse, 311° 27′ 2

Spectacle Island (Hunt's Island), Southampton, 1922—Close reoccupation of C I W station of 1907 Near center of western part of island in a low circular opening among small trees where soil is deep enough to permit setting tent, two cedars, 9 feet (2 7 meters) apart somewhat larger than those surrounding station are 18 feet (5 5 meters) and 22 feet (6 7 meters) to southeast, a clump of bushes is 12 feet (3 7 meters) west of station, and edge of dense thicket is about 25 feet (7 6 meters) to eastward True bearings right wireless tower at Daniel's Head, 4 miles (6 4 km), 141° 16′ 5, left edge of tank at Boaz bridge, 159° 14′ 1, left clock-tower at dockyard, 180° 34′ 2, right clock-tower, 180° 41′ 6, vane on Gibbs' Hill Lighthouse, one-fourth mile (0 4 km), 351° 28′ 2

CANARY ISLANDS

Las Palmas, Gran Canaria, 1925—Two stations were occupied Station *A* is a close reoccupation of stations of 1912 and 1915, about midway between Port de la Luz and Las Palmas, directly west of Hotel Metropole on a level plot of ground belonging to Elder Dempster Company, near edge of cliff, at second sharp turn in Jones's Road which leads to summit of hill, west of intersection with road which continues westward, 32 6 meters northeast of northeast

ISLANDS, ATLANTIC OCEAN

CANARY ISLANDS—*concluded*

Las Palmas, Gran Canaria, 1925—continued corner of stone foundation, 53 7 meters south of stone marker beyond road numbered "A-53," marked by cross cut in natural stone True bearings signal staff on lighthouse at Isleta, 199° 57′ 9, center of corner chimney on Hotel Metropole, 270° 21′ 5, cross on convent, 291° 44′ 2, spire on church in Las Palmas, 314° 33′ 5

Station *B* is a little more than 1 kilometer west of station *A* reached by continuing west along Jones's road across valley to second hill where road to battery meets concrete irrigation canal, thence south 0 5 kilometer to line of white stone markers, it is on east side of mound of red clay, 21 9 meters west of canal, 13 95 meters north of marker A-35, measured from point on wall of canal 20 5 meters from near edge of marker True bearings tall chimney on lone house on hill, 51° 45′ 2, signal light on end of mole at port, 223° 37′ 4, left edge of white marker A-35, 359°

Santa Cruz, La Palma, 1925—About 3 kilometers north of wharf in city, on property belonging to British consul, near south corner of old tennis-court, about 30 meters below home of consul, 7 0 meters from inside edge of low wall northwest of court, 3 5 meters from outside edge of wall to southwest and 4 2 meters from outside edge of wall to southeast of court True bearings seaward edge of home of José Acosta, 13° 45′ 0, south spire on front of home of Armando Yanes, 28° 25′ 2

Santa Cruz, Tenerife, 1925—Exact position of C I W station of 1911, 1914, 1915 being unavailable, observations were made about 100 feet (30 5 meters) farther south near center of rectangular level area about 90 meters east of Hotel Quisisanna, about 15 meters northeast of point where footpath joins driveway, 39 6 meters southwest of lone palm near excavation for new building, 6 0 meters southeast of terrace and 4 7 meters from wall along southeast boundary of area above new driveway True bearings tall spire on front of new church beyond town, 21° 58′ 7, flagpole on hotel, 127° 16′ 2, west wireless tower, 343° 18′ 7

FALKLAND ISLANDS

Between-the-Rocks, East Falkland, 1925—Also called "Half-Way Rocks," on camp or pampa owned by Falkland Islands Company, about 5 miles (8 km) northwest of Fitzroy, southwest of track from Mount Pleasant to Fitzroy, on clear space near center of group of small rocks, marked by cross cut in top of rough native stone True bearings right edge of rock, one-fourth mile (0 4 km) 14° 07′ 4, Mount Pleasant peak, 8 miles (13 km), 104° 21′ 1

Port Louis, East Falkland, 1925—Exact reoccupation of British Admiralty station, *Erebus* and *Terror,* 1842, and *Challenger,* 1876, on point between two bays, north of farm buildings of Falkland Island Company, about three-fourths mile (1 2 km) southeast of farm house of Mr J Robson, about 100 meters southeast of ruins of old French fort, marked by stone monument, 8 by 12 inches (20 by 30 cm) projecting 1 foot (30 cm) above ground, protected by a copper cover upon which is inscribed the following "Magnetic Observing Station, H M S *Erebus* and *Terror,* 1842, dip 52° 26′, also of H M S *Challenger,* 1876, dip 48° 00" True bearings extreme west point of island, 4 miles (6 km), 232° 29′ 2, east gable of farm house, 4 miles (6 km), 359° 50′ 1

ISLANDS, ATLANTIC OCEAN

FALKLAND ISLANDS—*concluded*

Port Stanley, East Falkland, 1925—Three stations were occupied Station *A* is an exact reoccupation of C I W station of 1913, and is "variation station" of British Admiralty, it is on ridge at Navy Point across harbor from town of Stanley, in saddle between two clusters of outcropping rocks, marked by square stone projecting about one foot (30 cm) with piece of marble set in top, with word "variation" engraved and hole to mark center True bearings gable of slaughter-house, 2 miles (3 km), 8° 42′ 4, cathedral spire, 43° 44′ 5, lighthouse, 5 miles (8 km), 242° 52′ 8, left wireless mast of two, 4 miles (6 km), 300° 55′ 9, right wireless mast of two, 4 miles (6 km), 302° 27′ 9

Station *B* is exact reoccupation of C I W station *B* of 1913, on hillside southwest of governor's residence, in slight depression north of clump of gorse bushes, 21 2 meters south of wire fence inclosing paddock True bearings right wireless mast of seven, 3 miles (5 km), 103° 45′ 2, weather vane on town hall, one-half mile (0 8 km), 264° 21′ 1, cathedral spire, one-half mile (0 8 km), 270° 49′ 6

Station *C* is probably an exact reoccupation of C I W station *C* of 1913 as a wooden stake was found corresponding to its position by measurement, it is south 2° 51′ 4 west of station *B* distant 50 5 meters and higher up on hillside, 45 0 meters north of south fence of paddock True bearings right wireless mast of seven, 3 miles (5 km), 104° 34′ 4, weather-vane on town hall, 260° 41′ 6, cathedral spire, 268° 17′ 1

Station *B* and *C* were left unmarked Both will be marked by Colonial Engineer with brass bolts set in concrete posts, and record will be made in his office

MADEIRAS

Funchal, 1925—Four stations were occupied Station *A* is a close reoccupation of former C I W station near north center of drill-ground in Quartel de Infanteria 27, 66 3 feet (20 21 meters) from concrete wall at back of drill-ground, 49 5 feet (15 09 meters) from near corner of concrete base of wooden post at left end of row near southwest wall, and 34 8 feet (10 61 meters) from near corner of concrete base of second wooden post from right of row along northwest end of ground, marked by peg True bearings spire on Catholic church, 314° 33′ 2, outside edge of far pillar of entrance gate, 326° 40′ 5

Station *B* is about one-third mile (0 5 km), south and a little east from station *A*, in Funchal football-park, 0 8 kilometer east of wharf, on south side of Campo do Almirante Pass along seashore, near southwest corner of park, 37 8 feet (11 52 meters) from a three-foot sea-wall, 54 3 feet (16 55 meters) from board fence at west end of park, 16 5 feet (5 03 meters) outside playing field boundary-line at west goal-posts, and 46 3 feet (14 11 meters) southeast of nearest tree of row near west fence, marked by peg True bearings southeast edge of Campo Grande store across street, 220° 51′ 2, tip of cupola on fort by sea, 280° 35′ 9

Station *C* is a reoccupation of station *C* of 1914 as close as possible from measurements, on level spot about 18 meters above sea, about 0 2 kilometer east of large fish cannery, about 5 kilometers east of town, 33 5 feet (10 21 meters) south of retaining wall, and 45 6 feet (13 90 meters) southwest of near corner of concrete hut whose right edge is in line with Brazen Head, Sail Rock being seen a little farther to right Fragments of stone scattered about were found to be highly magnetic True bearings

ISLANDS, ATLANTIC OCEAN

MADEIRAS—*concluded*

Funchal, 1925—continued
left edge of brick smoke-stack 20 feet (6 meters) above ground, 74° 31′ 3, left edge at top of main chimney at fish cannery, 106° 03′ 0, tip on point at Brazen Head, 8 kilometers, 268° 06′ 1

Station *D* is about one-fourth kilometer southwest of station *C* and south of fish cannery, 100 feet (30 5 meters) from near smoke-stack, 69 feet (21 0 meters) east of south end of a rock ditch, 70 feet (21.3 meters) from cliff at south, and 40 feet (12 2 meters) from cliff to east True bearings left edge at top of near chimney, 127° 47′, station *C*, 245° 34′ 8, top right edge of concrete hut, 247° 47′ 2, tip on point at Brazen Head, 267° 44′ 6

WEST INDIES

Aux Cayes, Haiti, 1922—On gendarmerie rifle-range, about three-fourths mile (1 2 km) east of town, between trail and beach, 216 0 feet (65 8 meters) northwest of southwest corner of small stone storage house, 32 feet (10 meters) south of south edge of low embankment used as firing position of rifle-range about 25 feet (8 meters) from edge of trail, and 32 feet (10 meters) from approximate beach-line, marked by irregular stone of hard flint set almost flush with surface of ground, lettered roughly "C I W. 1922," a cross near center marking exact spot True bearings tip of hexagonal cupola on house near boat-landing, 70° 47′ 0, tip of tower on Bureau du Port, 79° 41′ 3, tip of tower on International Hotel, 88° 22′ 0

Azua, Dominican Republic, 1922—About 1 kilometer north of reservation for reservoir, known as "Resoli Hill," about 70 feet (21 meters) above level of town, 75 feet (23 meters) from driveway to south, 59 feet (18 meters) from edge of driveway west, at a point opposite branch driveway, about 400 feet (122 meters) north of reservoir, and 134 paces west of supply pipe-line, marked by cross in top of natural stone firmly embedded, the part showing above surface being nearly circular and about 8 inches (20 cm) across, and extending about 1 inch (3 cm) above surface of ground True bearings tip of dome on church, 2° 46′ 2, tip at extreme right of four on square tower on same church, 4° 47′ 2, westerly point on tile roof of new schoolhouse, 348° 42′ 7

Basse Terre, St Christopher, 1922—In Botanic Garden at west end of town, north of circular sunken garden near gardener's office, 26 0 feet (7 92 meters) south of southwest corner of stone catch-pit, 18 8 feet (5 73 meters), 29 2 feet (8 90 meters), and 33 5 feet (10 21 meters) from trees to west, northwest, and north respectively, and 9 5 feet (2 90 meters) north of stone marking station of 1905 which could not be reoccupied because a flower bed had been built close to it on the south True bearings nearest gable of nearest low house across hedge outside of garden, property of Mr Perkins, sr, 118° 33′ 6, ornament on house gable, just visible over boundary hedge of garden, 2 miles (3 2 kilometers), 172° 49′ 8, gable of gardener's office, 200 yards (183 meters), 260° 56′ 1

Bridgetown, Barbados, 1923—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1908, in old Naval Hospital grounds, northeast of Marine Hotel, now called Pomeroy Hotel, 26 8 feet (8 17 meters) nearly north of Transit of Venus pier, and 121 8 feet (37 12 meters) west of inside corner in stone wall along eastern boundary of grounds, marked by drill-hole in top of a lime-

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Bridgetown, Barbados, 1923—continued
stone post 6 by 10 by 20 inches (15 by 25 by 51 cm), marked "C I 1908" and projecting slightly above ground True bearings: staff at east end of roof of house, 21° 25′ 9, tip of ventilator at extreme right of house seen to right of Pomeroy Hotel, 83° 08′ 3, flagpole on Seaview Hotel, 93° 27′ 3, flagpole on sugar-mill, 237° 35′ 9, extreme left pyramidal point on tower of sugar-mill, 237° 47′ 1

Station *B* is 271 2 feet (82 66 meters) north-northeast of *A* and almost in line between *A* and large tree near wall, about 90 feet (27 meters) north-northwest of remains of old cistern, 81 4 feet (24 81 meters) south and 106 2 feet (32 37 meters) west of wall around property; marked by large stone projecting about 2 inches (5 cm) above ground, and lettered "C I," a cross indicating exact point, True bearings flagpole in line with station *A*, 21° 25′ 9, base of wind-vane on Hotel Pomeroy, 53° 29′ 6; left corner of chimney of gray stone house, 156° 48′ 8

Camaguey, Cuba, 1922—Two stations were occupied Station *A* is on grounds of the Agricultural College, about 6 kilometers south of city, on path to creek between cattle paddock and open field, and about 600 feet (183 meters) southeast of elevated water-tank in paddock; marked by granite block 6 by 8 by 6 inches (15 by 20 by 15 cm.), set flush with surface, the center being designated by a cross True bearings top of gage on water-tank, 147° 07′ 6; top of west edge of west door of cow-shed, one-fourth mile (0 4 km), 180° 02′ 3; gable of residence, one-half mile (0 8 km), 262° 29′ 2

Station *B* is 400 feet (122 meters) northeast of station *A*, on path to creek, about 15 feet (4 6 meters) east of northeast corner of paddock, and 10 feet (3 0 meters) east of wire fence, marked by rough granite block 6 by 8 by 4 inches (15 by 20 by 10 cm), set flush with surface, its center designated by a cross True bearings: station *A*, 12° 48′ 8, gage on water-tank 450 feet (137 meters), 92° 17′ 8; gable of pig-shed, 500 feet (152 meters), 136° 48′ 5

Cap Haitien, Haiti, 1922—In approximate center of parade-ground of marine encampment, directly in line with south end and 175 7 feet (53 55 meters) west of nearest corner of middle one of five barrack buildings, and 260 0 feet (79 2 meters) south of base of flagpole set in concrete directly in front of "Headquarters" at center of north side of square; marked by cement sewer-tile filled with concrete and set flush with ground, a half-inch (1-cm) hole near center marking exact spot, and letters "C I" cut roughly in top True bearing base of cross on Catholic church, 247° 54′ 6

Carenero Cayos, Cuba, 1926—A station for inclination only on one of the outlying cays off the mainland of Cuba, and described only by latitude and longitude and its plotted position on the chart of the United States Hydrographic Office

Cedros, Trinidad, 1923—At triangulation station of Trinidad surveying system known as "Fullerton Trig Station," in village of Fullerton west of Cedros, on highest point of hill west of end of Fullerton Road a branch of Perseverance Road leading out of Cedros, on clear space in coconut grove open to north and east towards ocean, about 30 feet (9 meters) south of edge of high cliff, and 20 feet (6 meters) northwest of edge of hill, marked by concrete post, about 6 inches (15 cm) square True

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Cedros, Trinidad, 1923—continued
bearing gable on warden's house in Cedros, about three-fourths mile (1 2 km), 268° 01′ 0

Charlotte Amalie, St Thomas, 1922—Exact reoccupation of C. I W. station of 1905, on side of hill, among masonry ruins of old sugar-mill, on premises of Mr A H Lockhart, about 1 mile (1 6 kilometer) east of town, 70 5 feet (21 49 meters) southwest of ruins of walls of stone house, and 70 feet (21 meters) northwest of uprooted tree, marked by cement post of 1905, on which hole at center is still distinguishable True bearings mast at signal station overlooking harbor entrance (Fort Cowell), 53° 33′ 0 mast on Bluebeard Castle, 97° 04′ 1, tip of root on Blackbeard Castle, 107° 23′ 6; northwest corner of ruins, 239° 58′

Christiansted, St Croix, 1922 Exact reoccupation of station of 1905, near wharf in plot used as park, northwest of old fort used as police station, in group of coconut trees, 82 feet (25 0 meters) southwest of nearest corner of radio hut which obscures New Fort Lighthouse from station, and 80 feet (24 4 meters) east of center of band-stand in line with St Croix Club, 36 1 feet (11 00 meters), 24 9 feet (7 59 meters), and 38 2 feet (11 64 meters) respectively from three coconut trees along walk to westward, the last and most northerly of which is in line with distant point of land, marked by bronze triangulation marker of the United States Coast and Geodetic Survey upon which is stamped "C I Magnetic 1905" the center being at the middle of the first E in the word GEODETIC True bearings: left edge of post-office, 33° 58′; gable of store across square at No 1 Church Street, 65° 12′ 8, far gable of St Croix Club seen through band-stand, 105° 01′ 2; east gable on pilot's house on island in harbor, 173° 15′ 3; left edge of police station, 232° 12′, right edge of police station, 315° 06′

Curaçao, Curaçao Island, 1922—See Willemstad *1918, A* and *B*

Frederiksted, St Croix, 1922—In north end of triangular plot of ground owned by city and used as playground, northeast of police headquarters and jail, east of and in line with north wall of first building south of municipal tennis-courts, 27 feet (8 2 meters) from nearest tree to south, 22 feet (6 7 meters) and 23 feet (7 0 meters) respectively from nearest trees to northeast and northwest, 51 5 feet (15 70 meters) and 45 feet (13 7 meters) respectively from two nearest trees on road to west; marked by coral rock post, 3 inches (8 cm) by 5 inches (13 cm) projecting about 4 inches (10 cm) from surface of ground and set on bed-rock coral, with "C I 1922" cut in top of marker True bearings pole at southwest corner of playground, 150 feet (46 meters), 5° 25′; north wall of buildings across road, 85° 16′, center of top of ruin of stone windmill, 165° 10′ 9; flagpole on east end of St Gerald Hall, 295° 53′ 2, Catholic church spire, 303° 43′ 4

Fort de France, Martinique, 1922—Exact reoccupation of C I W station of 1905, in grounds of military hospital in northeastern part of town, about 75 feet (23 meters) west of walk leading to doctor's office from main entrance, 26 0 feet (7 9 meters) southeast of tree at corner of small garden bordered by trees, and 56 5 feet (17 22 meters) and 42 5 feet (12 95 meters) respectively from first tree west and first tree north of corner, marked by a stone 6 by 8 inches (15 by

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Fort de France, Martinique, 1922—continued 20 cm) on top and lettered "C I 1905" True bearing letter V in word "Vestiare" over door, 197° 24′ 8

Gonaives, Haiti, 1922—On gendarmerie rifle-range, about 1 mile (1 6 km) due south of town, on low mound rising slightly above surrounding flat about 50 feet (15 meters) east of extension of center line of Rue Republicaine, about 50 feet (15 meters) west of west end and approximately on extension of longitudinal axis of embankment at firing position of range, marked by stone of flint about 4 by 12 by 24 inches (10 by 30 by 61 cm) set almost flush with surface of ground, with hole drilled to mark exact spot True bearings tip of tower on city hall or Hotel du Ville, 178° 10′ 7, base of flagstaff on tower of Centennial Building, 181° 32′ 0, Geological Survey signal station on low mountain, 190° 05′ 8, tip of tower on Catholic church, 190° 23′ 6

Guantanamo Bay, Cuba, 1922—On grounds of U S naval station, about 1 mile (1 6 km) south of transmitting wireless station, on No 1 rifle-range, between 400-yard and 500-yard line, 51 feet (15 5 meters) east of marker No 30, and 14 6 feet (4 45 meters) south of marker No 24 of the 500-yard line, marked by cement block 5 inches (13 cm) square set flush with surface, the center designated by a drill-hole and marked with letters "C I W 1922" True bearings top of staff on south wireless tower, 129° 41′ 6, top of staff on north wireless tower, 134° 09′ 4, flagstaff on house on point, 176° 44′ 1

Havana, Casa Blanca, Cuba, 1922, 1924—Three stations were occupied Station *A*, occupied in 1922 and in 1924 is an exact reoccupation of United States Coast and Geodetic Survey station "Las Cabanas," on military reservation of Morro Castle, about 300 yards (274 meters) north of Cuban National Observatory, measured along trail leading to a peon's house, about 150 feet (46 meters) southwest of peon's house, and 12 feet (4 meters) north of boundary monument 6 feet (2 meters) high, the first one seen on going north toward sea from observatory, marked by northern cross of two about 6 feet (2 meters) apart, cut into natural rock True bearings northern edge of Cabanas Fortress, three-fourths mile (1 2 km), 76° 32′ 3, tip of Morro Castle light, 105° 06′ 0, spike on water-tank, three-fourths mile (1 2 km), 262° 25′ 5, ornament on cupola on Quarantine Hospital, one-half mile (0 8 km), 299° 14′ 8, gable of roof on Quarantine Hospital, 301° 11′ 3 In 1922 diurnal variation in inclination was observed at a secondary station about 50 feet (15 meters) from station *A*

Station *B*, occupied in 1924, is 252 feet (76 8 meters) northwest of *A* and 351 feet (107 0 meters) southeast of southeast corner of barracks, marked by cross cut in surface stone True bearings Morro Castle light, 105° 28′ 2, spike on water-tank, 264° 02′ 4, flagpole on observatory, 338° 16′ 2

Havana, Villa, Cuba, 1922—Exact reoccupation of C I W station of 1905, 1908, and 1916, designated as Havana, Villa, in suburbs of Havana, about 3 kilometers south of main buildings of Colegio de Belen, at the Villa Asuncion de los Jesuites, about 100 meters west of seismic observatory, on concrete observing-pier about 1 4 meters high, marked by intersection of three foot-screw grooves on top of pier True bearing eastern tower of railway station, 177° 22′ 9

Kingston, Jamaica, 1922—Two stations were occupied Station *A* is the United States Coast and Geodetic Survey station of 1905, and C I W station of 1908 and 1914, about 2 miles (3 km) west of Kingston on road to Spanish Town, on farm owned by Mr A L Keeling, known as Greenwich Farms, on Kingston side of harbor directly opposite Port Royal It is about 250 feet (76 meters) from shore and easily seen from vessel on entering harbor, it bears south 69° 08′ west from guango tree 32 inches (81 cm) in diameter and 230 5 feet (70 25 meters) distant, and south 30° west from second guango tree 138 6 feet (42 24 meters) distant, about 120 paces northeast of ruined building near shore, marked by stone, 6 by 6 inches (15 by 15 cm), set in 1905, on which the drill-hole is still visible, but lettering has been obliterated True bearings tip of Lookout Tower at Port Royal, 29° 24′ 0, Plum Point Lighthouse, 323° 28′ 3

Station *B* is 179 6 feet (54 74 meters) north 77° 03′.8 east from station *A*, 60 feet (18 meters) southwest of large guango tree, 42 feet (12 8 meters) from a lignum vitæ tree, about 275 feet (84 meters) south of wire fence in front of residence, marked by cement block projecting about 5 inches (13 cm) and marked "C I W 1922" True bearing Lookout Tower, 29° 51′ 2

A secondary station for diurnal-variation observations was established under guango tree 46 7 feet (14 23 meters) from station *B* in extension of line from Lookout Tower

Kingstown, St Vincent, 1923—Two stations were occupied Station *A* is an exact reoccupation of C I W station of 1905, on grounds of agricultural experiment station, east of post-office and public offices, in division of grounds allotted for use of grammar school, 127 4 feet (38 83 meters) southeast of south corner and 157 4 feet (47 98 meters) south of east corner of school building, marked by stone 12 by 12 by 24 inches (30 by 30 by 61 cm) set flush with ground and lettered "C I 1905," a cross marking center True bearings flagpole on house, 20° 10′ 1, small gable over doorway of house, 345° 54′ 9, flagpole on stone house, 347° 49′ 6

Station *B* is 82 5 (25 15 meters) nearly north of station *A*, directly in front of small steps near east corner of school building and 78 feet (23 8 meters) distant, about 12 feet (3 7 meters) south and southeast respectively from two palms and 5 feet (1 5 meters) northeast of a third palm, marked by cross cut in top of stone lettered "C I 1923" True bearing base of cliff at water-line about 8 miles (13 km) distant, 21° 34′ 9

La Jaille, Guadeloupe, 1922—About 5 kilometers northwest of Pointe à Pitre, on lawn of experiment farm, about midway between gardener's office and north-south road leading off main highway between Pointe à Pitre and Basse Terre, between two circular flower-beds in front of gardener's office, 91 feet (27 7 meters) east of largest tree near office, and 31 2 feet (9 51 meters) south of large breadfruit tree, marked by 3-inch (8-cm) stake of paletofier wood, a shingle-nail marking exact point True bearings middle girder of south wireless mast, 70° 57′, high near gable of gardener's office, 101° 07′, near corner of two-story house, 145° 26′, gable of house, 282° 26′ 8

La Romana, Dominican Republic, 1922—Directly south of wharf, in lot southeast of manager's residence, west of cement wall, 39 feet (11 9 meters) north of wire fence, over cement monument flush with surface of ground, marking southerly end of base-line

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

La Romana, Dominican Republic—continued
established by United States Hydrographic Survey, the north monument being 870 feet (265 meters) distant just north of steps leading down from street to wharf True bearing north monument of base-line, 170° 45′ 6

Las Cabanas, United States Coast and Geodetic Survey station—See *Havana, Casa Blanca*

L'Atallye, Haiti, 1922—On land belonging to United West Indies Corporation, about 3 miles (4 8 km) east and a little north of village of St Michel, on pasture land about one-fifth mile (0 3 km) southeast of ranch house, 205 6 feet (62 67 meters) southeast of northeast corner and 236 4 feet (72 05 meters) east of southeast corner of uncompleted concrete granary, marked by concrete post 12 by 12 by 26 inches (30 by 30 by 66 cm) extending about 2 inches (5 cm) above surface of ground, and lettered roughly "C I W 1922," a brass screw near center marking exact spot True bearings southeast corner of mill just below eaves, 65° 20′ 3, left-hand edge of mill smoke-stack, 69° 02′ 9, southeast corner of granary, 4 feet (1 2 meter) above ground, 98° 49′ 9, northeast corner of granary, 4 feet (1 2 meter) above ground, 123° 35′ 4

La Vega, Dominican Republic, 1922—In pasture-lot on south bank of stream flowing just north of town, at a point about 80 feet (24 meters) from bank of stream and about 300 feet (91 meters) west of and almost directly opposite abutment supporting south end of bridge over stream on highway into town from north, 11 6 feet (3 54 meters) southwest of double mango tree, 34 8 feet (10 61 meters) west of nearer of two royal palm trees about 5 feet (1 5 meters) apart, and 39 0 feet (11 89 meters) southeast of double lignum vitæ tree, marked by hardwood stake True bearings cleft in rock on mountain top, 12 miles (19 km), 88° 54′ 7, first vertical truss at west side of south end of bridge, 265° 05′ 1

Mandeville, Jamaica, 1922—On property of Bell Hotel, on hill about 500 feet (152 meters) east of hotel, about 200 feet (61 meters) east of stone wall running north and south, 27 8 feet (8 47 meters) south of stone wall running east and west, and 80 5 feet (24 54 meters) northwest of stone mound used in target practice, marked by irregular stone set flush with surface, its center designated by drill-hole True bearings gable of house, 58° 23′ 3, gable of house, on higher ground, 79° 18′ 0, east gable of house on top of hill, 346° 15′ 6

Matanzas, Cuba, 1922—On grounds of Chapel of Monserrate, about 2 miles (3 km) northwest of city, on high hill facing Yumuri valley, 98 8 feet (30 11 meters) west of northwest corner and 114 5 feet (34 90 meters) northwest of southwest corner of chapel, 79 1 feet (24 11 meters) north of C I W station of 1905, and 11 9 feet (3 64 meters) south of north stone wall, marked by flat stone slab lettered "C I W 1922" True bearings tip of pyramid-shaped house, 2 miles (3 km), 116° 05′ 4, north doorway of house across Hershey railroad, 207° 36′ 4, old C I W station, 328° 21′ 8

Montego Bay, Jamaica, 1922—On property known as Jarrett Park, about 1 mile (1 6 km) southwest of town, 119 7 feet (36 48 meters) southeast of southwest corner of fence inclosing tennis-courts, 35 feet (11 meters) south of cluster of lime and logwood trees, and 10 4 feet (3 17 meters) north of rock 7 by 2 feet (2 by 0 6 meters) embedded in ground, marked by

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Montego Bay, Jamaica, 1922—continued
hardwood peg 2 inches (5 cm) square and 15 inches (38 cm) long, its center designated by a brass screw True bearings west side of house on hill, 3 miles (5 km) 46° 06′.8, ornament on roof of house on hill, one-half mile (0 8 km), 264° 04′ 3, lower west edge of iron stack of sugar-mill, one-half mile (0 8 km), 327° 17′ 8

Pinar del Rio, Cuba, 1922—About 400 yards (366 meters) due north of C I W station of 1905, which could not be reoccupied because of buildings on the site, on hill in northwest section of city, facing deep valley extending toward Sierra Mountains, on private grounds, about 300 yards (274 meters) north of military stables, and about one-fourth mile (0 4 km) northeast of Spanish colonia or sanitarium, marked by limestone block 4 by 6 by 12 inches (10 by 15 by 30 cm), set flush with surface, its center designated by cross True bearings gable of Spanish colonia, 58° 46′ 5, tip of highest peak in mountain range, 3 5 miles (5 6 km), 97° 09′ 7, east edge of Bishop's residence in town, 1 5 miles (2 4 km), 334° 55′ 2, base of high wireless staff at point where it joins supports, 356° 40′ 7

Placetas del Norte, Cuba, 1922—Two stations, *A* and *B*, were occupied, being close reoccupations of stations of 1908-09 designated as *Placetas A* and *Placetas* respectively Station *A* is in northwest corner of open field bounded by Quinta del Sur on north and Central del Sur on west, about 200 feet (61 meters) from north street, about 250 feet (76 meters) from west street, and about 20 feet (6 meters) north of path running diagonally across field, marked by granite block 8 by 6 by 6 inches (20 by 15 by 15 cm), set flush with surface, center designated by cross True bearing north edge of square chimney of sugar-mill, 3 miles (5 km), 313° 35′ 9

Station *B* is in southwest part of town, on grounds of market plaza, in corner bounded on southeast and southwest by street called Segunda del Oeste and Cuarto del Sur respectively, about 135 feet (41 2 meters) southwest of south corner of market building, and 30 feet (9 1 meters) northeast of center of Cuarto del Sur, and 60 feet (18 3 meters) northwest of center of Segunda del Oeste, marked by cement block 5 by 5 by 12 inches (13 by 13 by 30 cm), set flush with surface and lettered "C I W 1922" True bearing northwest corner of old building distinguished by archway over sidewalk, 350 feet (107) meters, 208° 28′ 0

Port Antonio, Jamaica, 1922—On property known as Olivier Park, about three-fourths mile (1 2 km) east of town, facing Eastern Harbor, about 200 feet (61 meters) east of mouth of Caneside River, and 44 5 feet (13 56 meters) south of lone almond tree on shore, marked by bulletwood peg 2 inches (5 cm) square and 12 inches (30 cm) long, with its center designated by a brass screw True bearings northeast corner of nave of cathedral, one-fourth mile (0 4 km) 101° 27′ 3, spike on court-house roof, 1 mile (1 6 km), 125° 32′ 9, tip of cupola on Hotel Litchfield, 1 5 mile (2 4 km), 140° 26′ 5, Navy Island Beacon, 1 mile (1 6 km), 171° 42′ 7, Grant's Rock Beacon, three-fourths mile (1 2 km), 199° 57′ 0, north range pole, 100 yards (91 meters), 266° 26′ 6, south range pole, 200 yards (183 meters), 329° 26′ 1

Port au Prince, Haiti, 1922—Two stations were occupied Station *A* is on grounds of United States Marine Corps aviation field, about 1 mile (1 6 km) north of

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Port au Prince, Haiti, 1922—continued
central part of city, near north side of landing field, about 75 feet (23 meters) east of point from which twin towers of cathedral appear in line, 649 feet (197 8 meters) north of northwest corner of airplane machine-shop, and about 20 feet (6 meters) south of cactus hedge, marked by concrete post about 8 inches (20 cm) square, set almost flush with surface of ground and having set in top a brass plate stamped "Carnegie Institution of Washington, 1922," a brass screw in cement marking exact spot True bearings tip of church steeple, 9° 44′ 9, right tower of cathedral, 16° 14′ 7, spire of San Josef Church, 51° 23′ 8, station *B*, 290° 24′

Station *B* is 534 feet (162 8 meters) east of station *A*, 693 feet (211 2 meters) northeast of northeast corner of airplane machine shop, and about 20 feet (6 meters) south of cactus hedge, marked by concrete post about 8 inches (20 cm) square, set almost flush with surface of ground and having set in top a brass plate stamped "Carnegie Institution of Washington, 1922," a brass screw in cement marking exact spot True bearings spire of church, 18° 18′ 0, left tower of cathedral, 22° 41′ 1, right tower of cathedral, 22° 49′ 1, spire of San Josef Church, 58° 15′ 3

Port Castries, St Lucia, 1922—Exact reoccupation of C I W station of 1905, in Botanic Garden, northeast of town, 40 feet (12 meters) south and 23 feet (7 meters) north of two drainage gutters, 53 5 feet 16 30 meters) and 46 5 feet (14 17 meters) southwest of trees at north and south ends respectively of a crescent-shaped flower-bed, and 88 5 feet (26 97 meters) and 82 8 feet (25 24 meters) respectively from large trees to north and south True bearings pole on gable of house, 44° 39′ 4, estimated center smoke-stack on lime factory, 68° 49′, gable of Mr Gordon's house, 205° 01′, left tangent of summer house, 311° 59′

Port of Spain, 1905, Trinidad, 1923—Exact reoccupation of C I W station of 1905, in grounds of Agricultural Experiment Station, just west of extreme northwest corner of Queen's Park Savannah, and near end of St Clair Electric Car Line, near west gate of grounds, 65 2 feet (19 87 meters) from west fence and 58 feet (17 7 meters) from south edge of roadway passing superintendent's office This station is not suitable for further reoccupations and old stone-marker was moved to station *A* in 1923

Port of Spain, Trinidad, 1923—Two stations were occupied Station *A* is in Queen's Park Savannah, about one-third mile (0 5 km) north of Queen's Park Hotel, 732 0 feet (223 11 meters) northwest of "Savannah Referring Mark," used by Crown Survey office, and at intersection of meridian line with azimuth line extended from referring mark to spire of Laventille Roman Catholic Church, marked by a hole in top of limestone post 6 by 6 by 30 inches (15 by 15 by 76 cm), lettered on top "C I 1905," set flush with surface of ground True bearings tip of tower of college building, 73° 48′ 5, tip of dome on large house, 98° 49′ 4, spire of Laventille Roman Catholic Church, and "Savannah Referring Mark," 307° 48′ 0, church spire seen at left of grandstand, 341° 39′ 1, tip of dome on government office building, 351° 42′ 8

Station *B* is in northeast part of Queen's Park Savannah, on stone known as "Savannah Referring Mark," just south of group of six large palms, and in line between station *A* and Laventille Church spire, marked by stone about 15 inches (38 cm) square, projecting 6 inches (15 cm) above ground, the exact point being marked by a hole in a small copper plate set in a depression in stone True bearings spire of Laventille Church, 307° 48′ 0, spire of Trinity Church, 352° 43′ 1

Puerto Plata, Dominican Republic, 1922—Within grounds of old fort on point at entrance to harbor, at foot of hill on which main building stands, 32 8 feet (10 00 meters) west of wall along east side of inclosure, 67 5 feet (20 57 meters) north of scrub sea-grape tree at tide-water mark, and 83 0 feet (25 30 meters) east of southeast corner of concrete hand-ball-court, marked by block of concrete 8 by 8 by 24 inches (20 by 20 by 61 cm), set almost flush with ground and lettered "C I , 1922," with cross on top True bearing highest point on large rock about one-half mile (0.8 km) out from shore, 155° 24′ 1

Rio Claro, Trinidad, 1923—On grounds of Public Works Department, in plot of open ground, almost in front of warden's house, and about 20 feet (6 meters) west of road, marked by concrete post 6 by 6 by 24 inches (15 by 15 by 61 cm), with brass plate set in top True bearings cross on Baptist church, 32° 38′ 7, staff on left end of Public Works office, 164° 10′ 4

Roseau, Dominica, 1922—In Government Botanical Garden, on grass plot roughly 500 feet (152 meters) square used for playing cricket, 190 5 feet (58 06 meters) southeast of station of 1905, and 197 0 feet (60 04 meters) southeast of flagpole in front of small cricket-house at edge of lawn in northwest part of garden, marked by hard granite stone, 6 by 6 by 12 inches (15 by 15 by 30 cm), set flush with ground, with drill-hole marking exact point True bearings right edge of Catholic church, one-fourth mile (0 4 km), 42° 44′ 2, gable of dormer-window on hospital, 94° 37′ 9, C I W 1905 magnetic station, 95° 09′ 9, flagpole in front of cricket-house, 125° 50′, anemometer on hill, one-half mile (0 8 km), 296° 58′ 9

St Johns, Antigua, 1922—At top of knoll in Victoria Park, east of two roads branching northeast and southeast from east end of High Street, 85 paces west of west fence of botanic garden, and 125 paces west by north from station of 1905, marked by concrete pillar 9 inches (23 cm) by 11 inches (28 cm) on top and inscribed "C I W 1922 " True bearings lighthouse, two-thirds mile (1 0 kilometer), 17° 49′ 1, pole at signal station on Rat Hill (leper colony), 1 5 miles (2 4 kilometers), 108° 26′ 0, north steeple of Catholic church, one-third mile (0 5 kilometer), 117° 11′ 5, chimney of old sugar-mill, 1 5 miles (2 4 kilometers), 183° 09′ 2

St Thomas, Virgin Islands, 1922—See Charlotte Amalie

Sanchez, Dominican Republic, 1922—On land belonging to Samana and Santiago Railway, on point about 40 feet (12 meters) above sea-level, about 500 feet (152 meters) east of end of tracks at Sanchez, and almost directly in front of house No 7 of railway company, about 20 feet (6 meters) from brow of hill to west, 11 feet (3 meters) from beginning of south slope, 17 feet (5 meters) from east slope, and 72 feet (22 0 meters) south of foot of large tree having spreading and irregularly shaped trunk at base, marked by rough stone about 22 inches (57 cm) long, with V-shaped top lettered on one face "1922" and on other "C I " True bearings tip at apex of roof at north end of wharf building, 54° 18′.5, tip of orna-

ISLANDS, ATLANTIC OCEAN

WEST INDIES—*continued*

Sanchez, Dominican Republic, 1922—continued ment at south end of roof of billiard and club room of Samana and Santiago Railway, 114° 20′ 5, small ornament on apex of roof at north end of British Vice-Consulate, 115° 18′ 3, corner porch-post nearest sea of residence, 1 5 miles (2 4 km), 292° 04′ 5

San Fernando, Trinidad, 1923—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1905, in southwestern part of government pasture and recreation grounds known as Paradise Savannah, about one-half mile (0 8 km) south of town, about 400 feet (122 meters) west of armory, on hill near big tree, and about 250 feet (76 meters) from fence on west, marked by stone, 6 by 6 by 36 inches (15 by 15 by 91 cm), set so as to project about 5 inches (13 cm) above the ground, and lettered on top "C I 1905" True bearings spire of Anglican church, 228° 51′ 5, spire of Wesleyan church, 243° 41′ 4

Station *B* is 56 9 feet (17 34 meters) from *A*, directly in line from it toward spire of Anglican church True bearings spire of Anglican church, 228° 51′ 8, spire of Wesleyan church, 244° 03′ 7

Santiago de Cuba, Cuba, 1922—Two stations were occupied Station *A* is exact reoccupation of main C I W station of 1909, on top of San Juan Hill, about 3 miles (5 km) east of city, about 230 feet (70 meters) south of monument erected in memory of American soldiers, and 30 feet (9 1 meters) north of intersection of west and south trench lines, marked by cement block with deep drill-hole in center, projecting about 6 inches (15 cm) above surface of ground True bearings flagpole in Raja Yaga grounds, 1 5 miles (2 4 km), 154° 36′ 6, flagpole in Agricultural grounds, three-fourths mile (1 2 km) 166° 00′ 4, stack of mill, 1 mile (1 6 km), 311° 58′ 4

Station *B* is about 400 feet (122 meters) south 34° 27′ 9 west of *A* on San Juan Hill, about 200 feet (61 meters) south of ruins of old foundation, about 15 feet (5 meters) west of path running south along top of hill, and 25 feet (8 meters) east of wire fence inclosing Agricultural College grounds, marked by concrete block 5 by 5 inches (13 by 13 cm), set flush with surface and marked "C I W 1922" True bearings flagpole in Raja Yaga grounds, 164° 50′ 3, tip of Fort Memorial 650 feet (198 meters), 226° 27′ 1, stack of mill, 297° 10′ 3

Santo Domingo, Dominican Republic, 1922—Two stations were occupied Station *A* is on grounds of Dominican receptoria or receivership of customs, about three-fourths mile (1 2 km) west of main part of city, 157 8 feet (48 10 meters) southeast of southeast corner of main building, 69 0 feet (21 03 meters) northeast of northeast corner and 112 5 feet (34 29 meters) west of northwest corner respectively of two houses, marked by rough flintstone rock set flush with surface of ground and having cross cut in top to mark exact spot True bearings tower on dwelling 7° 48′ 3, tower on similar dwelling, 10° 10′ 5, left wireless tower just above platform at base of upper single steel pole, 326° 35′ 2, right wireless tower at corresponding point, 334° 57′ 3

Station *B* is on grounds of Dominican receptoria 325 4 feet (99 19 meters) west of station *A*, 122 6 feet (37 37 meters) southwest of southwest corner of main building 74 3 feet (22 65 meters) northwest of northwest corner of dwelling-house, and 39 0 feet (11 89 meters) east of fence along roadway, marked by cross cut in top of rough flintstone set flush with surface of ground True bearings right wireless tower, 329° 47′ 2, tower on dwelling, 355° 01′ 8, tower on similar dwelling, 357° 42′ 3

Toco, Trinidad, 1923—At trigonometrical station No 120 of Trinidad Survey Department, on summit of hill about 75 feet (23 meters) above village, and nearly north of junction of Toco main road with Paria main road, marked by concrete block 12 by 12 by 24 inches (30 by 30 by 61 cm), projecting about 2 inches (5 cm) above surface of ground, and having brass plate with center mark and bearing number 120 True bearings Coconte trigonometrical station, 44° 29′ 2, Galera Lighthouse, 280° 29′ 8

Willemstad, Curaçao Island, 1922, 1926—Three stations were occupied designated *1913*, *A*, and *B* The first is a close reoccupation of C I W station of 1913, south of town on coral bar connected with western suburb, about 150 yards (137 meters) north of wireless telegraph station True bearings base of flagpole on church, 226° 52′ 9, west gable of American Consulate, 242° 47′ 5, flagpole at south end of baths, 310° 04′ 9

Station *A*, also reoccupied by U S S *Niagara* in 1926, is on grounds of old military hospital, about three-fourths mile (1 2 km) west of docks, 370 feet (112 8 meters) northwest of northwest corner of main building, 68 feet (21 meters) north of sandy road, and slightly west of projected line of fence running north down hill from old fort, marked by concrete post about 8 inches (20 cm) square, projecting 4 inches (10 cm) above surface of ground, and lettered roughly "C I," a brass screw marking exact spot True bearings delivery pipe from tank, just below platform, 16° 28′ 2, tip of water-tank at new military hospital, 134° 47′ 4, tip of left tower of Catholic church, 268° 15′ 6, tip of right tower of Catholic church, 268° 26′ 6, tip of water-tank near windmill on grounds of institution, 293° 03′ 4

Station *B* of 1922 is on grounds of old military hospital, 800 feet (244 meters) southeast of *A*, east of rock wall about 3 feet (0 9 meter) high surrounding building directly in front of entrance to grounds at a point exactly in line with middle of north wall and 118 1 feet (36 00 meters) southeast of its northeast corner, marked by concrete post 9 inches (23 cm) square, set 16 inches (41 cm) in ground and projecting 4 inches (10 cm) above True bearings tip of water-tank, 73° 52′ 6, small cross at rear end of Catholic church, 252° 59′ 4, tip of left tower of Catholic church, 255° 54′ 8, tip of right tower of Catholic church, 256° 21′ 2, prominent flagpole, 279° 23′ 4

ISLANDS INDIAN OCEAN

CEYLON

Colombo, 1921—Two stations were occupied in western part of grounds of Colombo University, in Cinnamon Gardens off Buller's Road Station *A* is an exact reoccupation of C I W station *A* of 1911 and 1918, 108 feet (32 9 meters) southwest of fence, 164 0 feet (50 0 meters) southwest of southwest corner of office building, and 80 6 feet (24 57 meters) west of thermometer shelter, marked by concrete block 5 inches (13 cm) square on top and lettered "C I W 1911" True bearings north corner of lunatic asylum, 55° 41′ 2, left corner near eaves of cricket-club grandstand, 123° 29′ 5, lower tip of small white spike over east gable of Grasmere, the surveyor-general's bungalow, 177° 26′ 0, nearest corner of office building, 212° 07′

ISLANDS, INDIAN OCEAN

CEYLON—*concluded*

Colombo, 1921—continued
Station *C* is an exact reoccupation of C I W station *C* of 1911 and 1920, 84 62 feet (25 79 meters) from station *A* in the direction of the spike on gable of surveyor-general's bungalow

COMORO ISLANDS

Dzaoudzi, Mayotte Island, 1921—Near probable site of French hydrographic station of 1900, about 2 kilometers east of Dzaoudzi, on shore, just above a small cove, about 100 meters west of northwest corner of native village, northwest of cattle park and low hill between native village and sea, and 0 5 kilometer north of Boulevard des Crabbes True bearings navigation mark on main island, 10 kilometers, 28° 25′ 2, prominent peak, 10 kilometers, 37° 48′ 0, bottom of wireless mast, 2 kilometers, 105° 39′ 3, south ornament on roof of Messageries residence, 2 kilometers, 108° 17′ 2

MADAGASCAR

Ambatondrazaka, 1921—In abandoned rice-field on north west outskirts of town, about 150 meters west of main road to Imerimandroso, at point in line with north side and 35 paces west of bend toward southwest of cart road skirting northwest quarter of town and 28 paces south of irrigation ditch running northwest across fields True bearings tomb on round hill above town, 4 kilometers, 2° 46′ 4, lamp-post at cross-roads, 500 meters, 51° 06′ 1, north gable of railway station, 500 meters, 95° 44′ 0, top of distant peak, 10 kilometers, 230° 31′ 1, telegraph-pole with stay at fork in road, 200 meters, 257° 55′ 6, cement pillar on main road, 150 paces, 289° 14′ 8

Ambinanindrano, 1921—On river bank, about 0 5 kilometer northeast of town, 100 paces along road to Mahanoro from its junction with main road to town and road going north to Morolamba, 17 30 meters east of northeast corner-post of bridge across river, and 5 paces south of road to Mahanoro True bearings near gable of house of mission, 1 kilometer, 10° 11′ 7, sign-post at junction of roads, 90 meters, 81° 15′ 0, northeast pole of bridge, 101° 38′ 9, summit of isolated rocky peak, 1 kilometer, 176° 38′ 7

Ambinany-Faraony, 1921—On sea-front, 32 60 meters and 31 10 meters south of southwest and southeast veranda-posts respectively of rest-house, and 14 paces west of coast line True bearings telegraph-pole with stay, 90 meters, 32° 52′ 0, southwest veranda-pole of rest-house, 180° 34′ 4, southeast veranda-pole of rest-house, 192° 15′ 4, telegraph-pole across river, 1 kilometer, 198° 20′ 6

Ambodivelatra, 1921—In clearing northeast of village and east of government rest-house, at a point in line with southwest side of rest-house and 41 30 meters southeast of its southeast corner True bearings southeast corner of rest-house, 109° 43′ 4, prominent white tree at foot of mountain, 1 kilometer, 115° 57′ 5, telegraph-pole on pass over hill, 1 kilometer, 200° 01′ 7

Ambohibe, 1921—On sandy flat behind government post, about 150 meters east of residence of Chef de Poste, about 100 meters south of house occupied by native governor, and 38 00 meters south of south corner of fence of native governor's compound True bearings cross on church, 350 meters, 42° 28′ 1, north gable end of mission residence, 300 meters, 58° 38′ 0, south veranda-post of residence,

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Ambohibe, 1921—continued
106° 49′ 3, south gable of native governor's house, 175° 27′ 9

Ambovombe, 1921—In west apex of triangular shaped piece of grass-land between rest-house and school, about 100 meters west of administrator's residence, 40 35 meters southwest of south corner of fence around rest-house, 56 40 meters northwest of northwest corner of foundation platform of school, 4 paces from road to south and 7 paces from road to north, marked by hardwood stake 15 centimeters in diameter and 1 6 meters long, projecting about 60 centimeters above surface of ground True bearings point where Tsihombe road crosses ridge, 5 kilometers, 87° 29′ 7, near corner of rest-house compound 219° 49′ 7, west gable of administrator's residence, 248° 21′ 2, northwest corner of platform foundation of school, 326° 03′ 7

Ampanihy, 1921—On low, scrub-covered ridge, about 1 kilometer northeast of government administrative post, about 400 meters northeast of "Place Publique," 200 meters north of Protestant church, about 80 meters west of main road to Bekily, and about 50 meters west of large prominent baobab tree, marked by pillar of limestone rocks, 90 centimeters high and 30 centimeters square, with coating of cement on top face True bearings near gable of doctor's house, 1 kilometer, 47° 00′ 1, geodetic beacon on Mount Ejaba, 10 kilometers, 95° 42′ 6, large baobab tree on sky-line, 1 kilometer, 208° 03′ 3, north edge of nearby baobab tree, 270° 04′ 1

Ampasimbaria, 1921—On river-bank, north of village, 47 paces west of government rest-house, and 24 paces southeast of lone tamarind tree, marked by rough block of granite, 15 by 15 by 65 centimeters, left projecting 15 centimeters above surface of sand True bearings tamarind tree, 114° 28′ 8, east peak of range to north, 10 kilometers, 149° 27′ 0, signal station at east end of low island, 6 kilometers, 174° 03′ 7, tree on beach, 500 meters, 233° 12′ 8, bottom of northwest pillar of rest-house, 271° 39′ 4

Andempona, 1921—On grass-land, about 230 meters south of government rest-house in village, and between main path to Antalaha and swamp west of path, 15 paces east of edge of swamp, and 50 30 meters west of telegraph-pole marked "1378" True bearings north end of Table Mountain, 8 kilometers, 3° 29′ 1, south gable end of rest-house, 182° 06′ 3, telegraph-pole numbered 1378, 254° 13′ 1, south end of Table Mountain, 358° 56′ 1

Andevorante, 1921—Close reoccupation of Pére Colin's station of 1892, on sand-dunes of Ambatojanahary, at north end of town, about 50 meters south of London Mission Church, and 5 75 meters southeast of most southerly of five upright stones marking Malgash tomb True bearings top of south stone of tomb, 138° 47′, south end of roof of London Mission Church, 202° 07′ 9, north end of ridge-pole of house, 100 meters, 302° 03′ 3, bottom insulator of telegraph-pole with stay, 90 meters, 350° 11′ 1

Andilamena, 1921—At north end of town, on open space across diagonal road southeast of government rest-house, 35 10 meters and 46 70 meters from southeast and southwest corners respectively of fence around rest-house, 18 paces east of diagonal road, and 11 paces from road to east True bearings southwest corner of rest-house fence, 128° 32′ 7, southeast corner of rest-house fence, 159° 18′ 9, spike on watch-tower,

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Andilamena, 1921—continued
350 meters, 252° 10′.2, tomb with horns, 3 kilometers, 292° 28′.2

Andranokelilalina, 1921—In small clearing at edge of forest, about 80 meters west-southwest of government rest-house, and 50 meters west of main road through village. True bearing: top of telegraph-pole with stay, second pole south of rest-house, 60 meters, 349° 26′.3

Androka, 1921—On Terrain Domainale, a large piece of grass-land between native village and sea, about 250 meters south of Poste Administratif, between two shady trees near south end of village, 19.90 meters from tree to west, 19.50 meters from tree to east, and 8 paces south of path. True bearings: north trunk of tree, 62° 37′, near gable of Indian store, 500 meters, 159° 43′.2, southwest corner of fence of Poste Administratif, 165° 10′.5, northwest veranda-post of office, 230 meters, 172° 33′.9, tree, 249° 38′

Andronadrona, 1921—On slightly sloping spur on steep hillside, about 60 meters northwest of government rest-house, 6 paces south of old road descending to rest-house. True bearings: white tree on hillside, 1 kilometer, 37° 08′.2, northmost visible telegraph-pole, 300 meters, 92° 42′.9, north end of roof of rest-house, 305° 54′.6, telegraph-pole with stay across valley, 300 meters, 316° 16′.8

Analalava, 1921—Near station of French Hydrographic Service of 1904, on sandy beach, 500 meters south of pier, 200 meters northwest of offices of Chef de Province, 39 paces southwest of road from government office to beach, and 8 paces from high-water mark. True bearings: west edge of island in bay, 10 kilometers, 97° 47′.9, north end of pier, 181° 32′.4, near gable of wharf building, 400 meters, 206° 38′.1, south end of office of Chef de Province, 294° 55′.2

Anjala, 1921—On hill slope north of government rest-house and south of swamp, practically in line with east side of rest-house fence, about 50 meters north of rest-house, and 30 paces from northeast corner of fence. True bearings: north gable end of roof of rest-house, 6° 49′.6, top of conical mountain, 30 kilometers, 62° 36′.6, top of telegraph-pole with stay, 60 meters, 125° 35′.6, lone tree on hillside, 1.5 kilometers, 159° 50′.6

Ankatoky, 1921—On open space, about 60 meters southwest of government rest-house, and 62 paces southwest of northwest corner of rest-house fence, whose true bearing is 212° 40′.7

Ankoroniky, 1921—At village of Ankoroniky, on coast path between Belo and Benjavilo, one and one-half days' march north of Belo, just northwest of village clearing, 13.70 meters southeast of large sacrifice-pole under large tree, and 9 paces north of path leading northwest from village. True bearing: top of sacrifice-pole, 135° 37′.7

Anosibe, 1921—In low scrub west of village, between two native paths which unite about 25 meters west of west edge of village clearing, 1 pace from each

Antalaha, 1921—Near center of public park, about 100 meters west of flagstaff near post-office, 24.70 meters southeast of solitary mango tree, and 125 paces northwest of road bounding park on southeast, marked by cement block 10 by 10 by 50 centimeters, its top face lettered "C I W" and projecting 5 centimeters above surface of ground. True bearings: mango tree, 122° 43′.1, ornament at west end of residence, 250 meters, 158° 52′.1, cross at east end of Catholic church, 150 meters, 220° 42′.0, hand-rail of bridge on road from southeast, 317° 53′.5

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Antalaha, 1921—continued

Antsirane, 1921— See Diego-Suarez

Beheloka, 1921—In scrub about midway between beach and hut of chief of village, 8 paces north of and 120 paces southeast along path leading from beach to chief's hut. True bearings: west end of ruined house of former fort, 0.6 kilometer, 50° 53′.6, north end of roof of chief's hut, 80 meters, 310° 18′.2

Belo, 1921—At extreme eastern end of Boulevard de Residence, north of rest-house, about 300 meters east of administrator's residence, in middle of street, near edge of cliffs overlooking river, 36.07 meters east of east face of sun-dial (known as "Sphinx") on pillar in street in front of residence of Chef de la Garde Indigene. True bearings: northwest corner fence around rest-house, 21.75 meters, 46° 13′.6, northwest edge of sun-dial, 75° 30′.7, tree at southeast corner of fence around Garde Indigene's residence, 26.55 meters, 97° 01′.0, telegraph-pole with stay, on river flat, 0.8 kilometer, 253° 23′.9, tree on distant ridge, 8 kilometers, 302° 55′.2

Benjavilo, 1921—Near Pere Colin's station of 1898, at edge of palm scrub, about 350 meters north of government rest-house, 60 meters east of beach, and just northwest of cluster of native huts at extreme north limits of settlement now abandoned as a military post. True bearings: north gable end of rest-house, 00° 04′.6, veranda post of government school building, 358° 37′.8

Bevilany, 1921—South of native village, near north entrance to narrow lane through cactus scrub, 24.20 meters southeast of southeast corner of rest-house, 2 paces and 4 paces from native paths to east and west, respectively. True bearings: near corner of rest-house, 132° 27′.0, shady tree in village, 187 paces, 150° 50′.2

Boubavato, 1921—In open space in middle of village, 27 paces north of government rest-house, and 18 paces east of mango tree. True bearings: mango tree, 82° 49′.1, lone palm tree, 3 kilometers, 114° 34′.4, village flagstaff, 40 meters, 292° 51′.9

Cap Sainte Marie, 1921—Northwest of Cap Sainte Marie, about 2 kilometers south of Bay of Vatomangy, on edge of cliff about 145 meters above sea, about 100 meters northeast of extremity of headland locally known as "Santa Marie." The southern extremity of the island could not be reached, as no trail through the cactus and thorn scrub could be found; the station selected is found by following native trail about one hour's march south of Betaimboraka to old government rest-house, thence about 4 kilometers southwest to cliff where trail turns abruptly southward along cliff about 1 kilometer to station. True bearings: conical hill on coast, 10 kilometers, 131° 27′.1, edge of cliff across bay, 6 kilometers, 134° 05′.5, conspicuous white rock on cliff near point where trail turns southward, 1 kilometer, 158° 27′.5

Diego-Suarez, 1921—Near the French Hydrographic Service station of 1887, 11.5 meters southwest of meridian-pillar, and 18.95 meters north of northwest corner of residence of port captain, marked by local authorities with stone block projecting several centimeters above surface of ground, its top face lettered "C I W." True bearings: northwest corner of port captain's residence, 13° 14′.4, top of signal-

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Diego-Suarez, 1921—continued
tower, 60 meters, 29° 56′ 4, cleft in distant crag on ridge, 10 kilometers, 128° 05′ 0, south corner of meridian-pillar, 234° 04′ 6, filalao tree, 5 paces, 266° 31′

Farafangana, 1921—On sea front, east of office of chief of province 47 15 meters east of northeast corner and in line with north side of wall around office and 29 30 meters northeast of low spreading tree; marked by a pyramidal stone of cement 12 by 14 by 53 centimeters, firmly embedded in a mass of rocks and cement, its top face left 12 centimeters above surface of ground, and a hole in center indicating exact point True bearings northeast corner of wall around office, 80° 15′ 1, southeast pillar of office of chief of province, 60 meters, 57° 31′ 8, top of navigation mark on point, 500 meters, 332° 08′ 0, blockhouse at military camp, 1 kilometer, 341° 55′ 5.

Faux Cap, 1921—On line of sand-dunes running parallel with road to Cap Sainte Marie, about 200 meters north of military post, at a point about 25 meters northeast of junction of main roads to Tsihombe and Cap Sainte Marie, 24 paces east of main road to Tsihombe and 16 paces west of branch road True bearings northeast corner of military post, 337° 18′ 7, north gable of residence of post, 348° 08′ 5

Fenerive, 1921—In large field surrounded by trees, 60 meters east of Catholic mission and 100 meters south of Catholic church, 1 kilometer west of beach (See note under Tamatave)

Fort Dauphin, 1921—At geodetic station, on east side of path between cemetery and militia camp and about 150 meters northeast of camp, marked by geodetic mark, a cement pillar 50 centimeters square standing 65 centimeters above surface of ground, center of top face of which is indicated by intersection of eight cross lines, north side of face bearing inscription "4th Comp Legion 1898" True bearings rock at point across bay, 0 5 kilometer, 38° 41′ 6, near gable of government school, 0 5 kilometer, 93° 08′ 1, cross on Roman Catholic church, 0 5 kilometer, 101° 56′ 6, geodetic beacon on Mount St Louis, 8 kilometers, 134° 29′ 5, sharp point on high peak, 10 kilometers, 149° 47′ 1, north gable of north mission residence, 0 5 kilometer, 338° 39′ 6

Hellville, 1921—See Nosi Bé

Iabako, 1921—Southwest of village, on grass-land between main road and native track leading south to water, and 20 05 meters southwest of west corner of rest-house True bearings prominent tree on ridge, 2 kilometers, 26° 20′ 3, cliff on mountain, 8 kilometers, 138° 03′ 5, west corner of rest-house, 242° 36′ 5

Imerimandroso, 1921—On grassy hill slope at north end of town, 48 50 meters northwest of northwest veranda-post of rest-house True bearings tree on hill across Lake Alaotra, 12 kilometers, 145° 18′ 2, northeast veranda-post of rest-house, 60 meters, 304° 18′ 9, northwest veranda-post of rest-house, 317° 01′ 3

Itampolo, 1921—In middle of open sandy space east of abandoned military post, in line with south wall of fort, and 77 paces east of its southeast corner True bearings loophole in southwest corner of fort, 80 meters, 84° 42′ 7, southeast corner of wall around fort, 85° 19′ 6, northeast corner of barrack building, 120 meters, 112° 48′ 9, tree on distant ridge, 5 kilometers, 241° 08′ 3

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Mahabo, 1921—In town, near middle of public grounds north of district office and west of post-office, at point in line with south wall of kitchen behind post-office and 35 02 meters west of its southwest corner, 12 00 meters east of large Latanier palm, and 9 15 and 10 40 meters northwest of northwest and northeast pillars respectively of small pavilion occupying center of grounds True bearings Latanier palm, 111° 52′ 1, northwest veranda-post of rest-house, 60 meters, 211° 20′ 8, west end of roof beam of post-office, 40 meters, 242° 09′ 0, south side of kitchen of post-office, 269° 23′ 7, south post of gateway to residence, 300 meters, 289° 19′ 9, northeast pillar of pavilion, 327° 19′ 6, outer edge of west gate-post of district office, 60 meters, 356° 10′ 6

Mahanoro, 1921—On grounds of Anglican mission, at north end of town, near middle of small open playground between church and residence of missionary in charge, about 100 meters west of residence, 20.85 meters northwest of eucalyptus tree at junction of paths, and 30 00 meters west of eucalyptus tree on path True bearings cross at south end of church, 150 meters, 41° 19′ 6, south side of doorway of mission residence, 260° 51′ 6, eucalyptus tree on path, 268° 36′ 7, eucalyptus tree at junction of paths, 287° 31′ 9

Maintirano, 1921—Two stations were occupied Station *A* is in middle of public square around which are grouped post-office, school, and government offices True bearings fork formed by two tamarind trees, 32 90 meters, 11° 13′ 3, north gable of post-office, 100 meters, 67° 55′ 8, tree behind school compound, 300 meters, 168° 21′ 3, northwest corner of compound, 98 paces, 224° 00′ 3, telegraph-pole with stay on corner of square, 291° 52′ 1, telegraph-pole, 43 15 meters, 329° 51′ 7

Station *B* is near site of Pere Colin's station of 1898, on river bank, just southwest of old abandoned military post, 20 paces west of line of mangroves, 41 paces east of high-water mark on river bank, and 6 paces north of native path

Majunga B, 1921—Exact reoccupation of C I W. station of 1920, on beach, in line with north side of administrator's residence, 9 65 meters from cross cut in sea-wall 60 centimeters above ground, marked by block of limestone whose exposed portion is 8 by 8 by 8 centimeters, bearing cross in top, with three letters "C I W", on three sides, respectively True bearings southmost electric-light pole at end of sea-wall, 2° 33′ 2, lighthouse at Katsepe, 10 kilometers, 93° 20′.3, light-standard in sea-wall, 200 meters, 358° 12′ 4

Manakabahiny, 1921—On low hill in bush, about 150 meters northwest of government rest-house in village, about 40 meters northwest of isolated grain hut at north end of village, and about 50 meters west of main path from Maroantsetra to Antalaha True bearings white tree in valley, 400 meters, 19° 52′ 5, highest peak to west, 2 kilometers, 103° 27′ 1, distant telegraph-pole with stay, 1 kilometer, 180° 48′ 1, telegraph-pole by main path, 50 meters, 251° 29′ 1

Manakara, 1921—On grassy sand-dune between government rest-house and temporary government office, 33 paces southeast of southeast corner of office, 33 paces northeast of northwest veranda-pole of rest-house, and 18 paces south of coconut palm True bearings telegraph-pole with stay, 100 meters, 16° 34′ 1, northwest veranda-post of rest-house, 40° 31′ 7, tree on ridge, 4 kilometers, 90° 15′ 6, southeast corner of government office, 151° 56′ 6

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Manambondro, 1921—On small piece of level ground part way up hill on which village is situated, between rest-house and main road north to Vangaindrano, about 50 meters west of rest-house, and 2 paces west of native path running down hill to stream from village True bearing prominent tree in village, 1 kilometer, 70° 29′ 8

Mananjary, 1921—On sand spit at extreme southern end of town, midway between ocean on east and river on west, in line with east fence of meteorological station and 56 62 meters south of its southeast corner, and 92 45 meters south of flagstaff, marked by slab of cement with rounded top, 1 35 meters high, 42 centimeters wide and 10 centimeters thick, firmly embedded in sand and strengthened with pieces of rock at base, the whole cemented together and projecting 50 centimeters above surface of ground, a black painted cross on top face indicating exact point, and an inscription on west face reading "C I W Station Magnetique" True bearings left gable of bungalow up river, 3 kilometers, 65° 09′ 4, V-shaped gap between two trees, 2 kilometers, 70° 28′ 2, bottom of flagstaff, 184° 11′ 2, southeast corner of fence around meteorological station, 198° 23′ 2

Manantenina, 1921—On summit of low hill north of military post, about 200 meters north of captain's residence, 2 paces south of path and 43 paces east along path from its junction with main road at a point 72 paces north of bridge over stream, marked by slab of gneiss, projecting about 1 meter above surface of ground True bearings north gable of captain's residence, 16° 35′ 8, top of church steeple, 500 meters, 49° 05′ 5, top of monolith near coast, 2 kilometers, 337° 47′ 8, large monolith of Malgash tomb, 1 kilometer, 351° 09′ 7, east edge of pagoda in grounds of residency, 356° 54′ 4

Mandabe, 1921—In town, near middle of public square, an open space lying between market building and rest-house, at a point in line with west line of veranda-posts of rest-house and 35 95 meters north of north veranda-post, and 24 30 meters south of large tamarind tree True bearings northwest veranda-post of rest-house, 17° 15′ 4, southwest veranda-post of market building, 61 paces, 156° 20′ 2, tamarind tree, 181° 46′ 8

Mandritsara, 1921—On low hill, about 1 5 kilometers east of government post, exactly in line with north fence of French cemetery, and 17 50 meters southwest of its northwest corner True bearings flagstaff at militia camp, 2 kilometers, 30° 11′ 8, spike on east end of roof of residence, 2 kilometers, 38° 31′ 0, north end of roof of Protestant church, 1 5 kilometers, 58° 20′ 3, summit of rocky peak, 5 kilometers, 121° 03′ 8, northwest corner of cemetery fence, 249° 35′ 8, top of north gate-post of cemetery, 40 meters, 307° 13′ 4

Mangatsiotra, 1921—On river bank, at south end of village, 27 paces southwest of most southerly house of village, and 20 paces north of bank of river True bearings telegraph-pole across river, 0 5 kilometer, 26° 11′ 3, stayed telegraph-pole on river bank, 250 meters, 50° 23′ 5, stayed telegraph-pole north of village, 192° 41′ 5, rock in middle of river, 150 meters, 337° 41′ 9

Manja, 1921—On southwest side of public square, a large open space south of compound containing office of Chef de District, at a point in line with southeast fence of inclosure outside of compound and 46 75 meters southwest of its south corner, 26 45 meters northeast of northeast veranda-post of school, and 10 60 meters north of north side of main road True bearings southwest corner of outer fence around district office, 80 meters, 160° 20′ 0, east side of gate-way to district office, 60 meters, 194° 31′ 5, south corner of outer fence of district office, 213° 41′ 1, tree at east end of public square, 100 meters, 313° 41′ 7

Maroantsetra, 1921—Near middle of triangular lawn formed by cross-roads at southeast corner of residency grounds, 22 08 meters south of southeast corner of fence of residency grounds, 51 50 meters east of lamp-post opposite south gate, 15 paces from west apex of lawn, 4 paces and 3 paces from edge of road to north and south respectively, marked by wooden post with inscription, "Place des Observations Magnetiques 1921" True bearings bottom of lamp-post outside of south gate, 97° 00′ 2, top of east gate-post of residence, 120° 09′ 0, southeast corner of residency fence, 199° 09′ 7, northwest veranda-post of public works department, 80 meters, 261° 37′ 6, signal-mast on beach, 300 meters, 320° 24′ 9

Marofotsy, 1921—On beach, about 150 meters southwest of southmost hut of village, 100 paces from high-water mark on beach, and 23 paces west of west bank of small water channel which is flooded at high tide True bearings top of white rock on beach, 1 kilometer, 87° 51′ 4, end of point, 1 5 kilometers, 92° 55′ 5, flagstaff at village, 200 meters, 226° 36′ 9; near gable of government rest-house, 300 meters, 279° 42′ 7

Moramanga, 1921—Two stations were occupied Station *A* is on south side of market place, west of public gardens at a point 35 65 meters south of the south-east corner and in line with east side of middle one of three south market-buildings, and 55 75 meters southeast of southwest corner of southwest market-building, marked by a cement stone 20 by 20 by 60 centimeters, its top face projecting 12 centimeters above surface of ground, and lettered "C I W" True bearings spike at west end of roof of residence, 60 meters, 41° 31′ 4, southwest pillar of southwest market-building, 140° 16′ 8, southwest pillar of central one of south market-buildings, 40 meters, 170° 37′ 2, southeast pillar of central one of south market-buildings, 189° 53′ 2, front gable of hotel, 250 meters, 198° 32′ 3, right window of ticket office at race-course, 300 meters, 358° 28′ 9

Station *B* is near Pere Colin's station of 1892, on pass over mountain of Tangaina, on grassy bank at north side of motor road, about 60 meters east of telegraph-pole which stands immediately above railway tunnel about 40 meters below and 13 40 meters west of kilometer stone "117 5" True bearings top of telegraph- pole on pass, 109° 39′ 9, prominent tree on hilltop, 1 kilometer, 280° 45′ 9, tree on mountain side, 1 kilometer, 286° 27′ 5, kilometer stone "117 5," 293° 44′ 2

Morondava, 1921—Two stations were occupied Station *A* is at extreme east end of town, just east of grounds of residence of Chef de Province, over cross cut in center of top of cement-faced brick pillar, 45 centimeters square, standing 90 centimeters above surface of sand, constructed in 1914 by French Hydrographic Service, 32 33 meters south of flag-

ISLANDS, INDIAN OCEAN

MADAGASCAR—*continued*

Morondava, 1921—continued
staff, and 28 60 meters east of east fence of residency grounds True bearings inner side at bottom of north post of residence gateway, 28° 04′ 6, flagstaff, 183° 54′ 7, northwest edge of out-building of school 250 meters, 294° 51′ 6

Station *B* is on waste land just southeast of large inclosure forming camp of company of Malgache Tirailleurs, about 300 meters south of station *A*, 8 paces southwest of foot-path at a point 88 paces southeast of south corner of camp inclosure True bearings south end of roof of powder-magazine, 100 meters, 99° 38′ 7, south corner of fence around military camp, 90 meters, 146° 02′ 4, south gable of school building, 350 meters, 189° 52′ 5

Nosi Bé, 1921—Near the French hydrographic station of 1899, on small piece of flat grass-land above Point Ankotsokotse, 3 90 meters south of center of road to Ambanoro, and 8 10 meters north of large mango tree on point True bearings west side of trunk of mango tree, 36° 29′ 2, front ornament on roof of house across bay, 600 meters, 97° 07′,7, south edge of navigation beacon on Fever Point, 600 meters, 321° 08′ 0, near gable of sanatorium, 5 kilometers, 341° 17′ 0

Nosivarika, 1921—Near southeast corner of large compound of government school, at point in line between north side of center doorway of school and south post of gateway in hedge on main street, 41 75 meters east of northeast veranda-post of school, and 14 85 meters west of south post of gateway in hedge True bearings, southeast veranda-post of school, 42° 10′ 4, northeast veranda-post of school, 78° 48′ 0, south post of gateway in hedge, 242° 47′ 7, palm tree, 0 5 kilometer, 276° 23′ 5, southeast corner of compound, 30 paces, 304° 30′ 7

Pointe Sada, 1921—Near French hydrographic station of 1899, at high-water mark on small sandy beach under low cliffs of small cove, about 50 meters south of Pointe Sada True bearings large tree across Baly Bay, 9 kilometers, 109° 47′ 5, Cape Amparafaka, 9 kilometers, 122° 07′ 4, tree on edge of cliff, 50 meters, 192° 55′ 2

Rantabe, 1921—On public square around which are grouped school, market, and rest-house, in middle of path leading to rest-house, 15 75 meters west of north gate-post of rest-house, and 20 60 meters northwest of flagstaff at office of Chef de Canton True bearings southwest veranda-post of school, 80 meters, 98° 56′ 4, south end of wooded island in bay, 20 kilometers, 227° 06′ 0, northwest corner of rest-house fence, 30 paces, 233° 52′ 8, north side of gateway of rest-house, 15 75 meters, 279° 39′ 6, flagstaff at office of Chef de Canton, 323° 39′ 3

Sambava, 1921—At southeast corner of town, at extreme south end of wide grassy street on which are situated residence of Chef de Poste, militia camp, and government rest-house, 37 65 meters south of large tree in middle of street, and 13 15 meters northeast of corner of fence at south end of street True bearings telegraph-pole, 70 paces, 24° 18′ 6, spike on red-roofed house, about 120 meters, 131° 16′ 2, flagstaff in street in front of residency, 250 meters, 151° 40′ 7, nearby tree, 154° 45′

Soavina, 1921—On hilltop south of village and 12 00 meters southwest of government rest-house, a building of palm and thatch True bearings bend in road on hillside, 1 kilometer, 73° 15′ 0, south corner of rest-house, 197° 04′ 7, east corner of rest-house, 20 meters, 216° 57′ 5

Tamatave, 1921—In middle of race-course 175 meters south of governor general's house, about 150 meters south of station established by Pere Colin, S J, in 1892 True bearing north edge of civil prison, 500 meters 68° 59′ 2

(Note Owing to inability of C I W observer to visit Tamatave because of quarantine, observations there and at Fenerive were made later by Pere Colin and the results kindly forwarded to the Department with permission to incorporate with report on survey of Madagascar)

Tondrolo, 1921—On open land at north end of village, just northwest of cattle kraal, and 47 paces west of sacred tree on side of main path to Maintirano True bearings prominent tree on distant ridge, 5 kilometers, 111° 29′ 4, sacred tree on side of main path, 259° 50′ 7

Tsihombe, 1921—In center of large public space about 150 meters north of government offices, marked by large block of gneiss, its upper end roughly shaped to form a stone 20 centimeters square, projecting 50 centimeters above surface of ground True bearings east side of large baobab tree at base, 150 meters, 151° 28′ 4, west corner of Indian store, 250 meters, 303° 16′ 5, west end of roof of residence of administrator, 300 meters, 305° 55′ 0, north gable of government school, 150 meters, 327° 15′ 6

Tsimilofo, 1921—On open space south of abandoned military post, about 50 meters south of rest-house for travelers, and 15 50 meters west of large tree near cattle yard True bearings telegraph-pole No 2288, 131 paces, 85° 15′ 4, east end of roof of rest-house, 181° 42′ 8, large tree near cattle yard, 258° 01′ 5

Vangaindrano, 1921—Near middle of public square, east of Poste Administratif, 12 85 meters east of flagstaff, in line with east side and 35 40 meters northeast of northeast pillar of market building, marked by block of gneiss 10 by 10 by 50 centimeters, its top face left projecting about 5 centimeters above surface of ground, and cross cut to indicate exact point True bearings tomb on low hill, 1 kilometer, 28° 01′ 6, bottom of northeast pillar of market building, 35° 01′ 7, bottom of flagstaff, 74° 31′, northwest pillar of market building, 50 meters, 79° 30′ 2, south end of roof of residency, 250 meters, 93° 04′ 0, steeple of church, 400 meters, 221° 30′ 4, north gable of hospital, 250 meters, 324° 44′ 0

Vatomandry, 1921—About 600 meters southeast of Pere Colin's station of 1900, which was no longer available for reoccupation on account of buildings, on low sand-dune east of Boulevard Maritime, in line with south side of tract reserved for new residency, 135 paces east of its southeast boundary stone, and 70 paces west of high-water mark on beach True bearings top of rock in sea, 700 meters, 13° 40′ 1, north end of post-office, 500 meters, 86° 33′ 1, southeast boundary stone of residency grounds, 99° 42′ 0, high telegraph-pole, 500 meters, 187° 06′ 2

Vohemar, 1921—North of town, on beach, at extreme northern end of Rue des Dames at its junction with road running northeast from wharf, about 0 5 kilometer north-northeast of administrator's residence, 12 paces from high-water mark, and 6 paces west-northwest of track leading to water's edge from

ISLANDS, INDIAN OCEAN

MADAGASCAR—*concluded*

Vohemar, 1921—continued
north end of Rue des Dames True bearings distant peak, 25 kilometers, 122° 52′.8, top of cliff across bay, 15 kilometers, 151° 37′ 1, west end of largest of three islands in bay, 3 kilometers, 166° 23′ 6, channel buoy, 250 meters, 207° 03′

ZANZIBAR

Zanzibar, 1921—Close reoccupation of C I W station of 1909, in west corner of Recreation Park, 186 feet (56 69 meters) from Mnazimoja Road, measured at right angles from point 327 feet (99 67 meters) southeast along road from point opposite southeast side of memorial to General Matthews, 339 feet (103 3 meters) east-southeast of south apex of triangular inclosure around memorial, and 419 feet (127 7 meters) northeast of angle in cemetery wall, marked by cement block 6 by 6 inches (15 by 15 cm) by 3 feet (0 9 meters), its top face sunk about 1 foot (0 3 meter) below turf, a sink-hole indicating exact point True bearings bottom left side of Matthews Memorial, 108° 05′ 0, top of steeple of English Cathedral, one-fourth mile (0 4 km), 182° 42′ 6, clock tower of government stables, one-fourth mile (0 4 km), 185° 13′ 8, stack of destructor, one-third mile (0 5 km), 199° 19′ 6, bottom of wireless mast, one-third mile (0 5 km), 199° 51′ 0

ISLANDS, MEDITERRANEAN

Candia, Crete, 1922—Close reoccupation of C I W station of 1911, in northeast corner of olive grove on terrace rising several feet above surrounding fields, about 200 meters southwest of wall surrounding cemetery and Church of St Constantine, just south of north edge of terrace, about 45 meters northeast of northwest corner of stone house, and about 45 meters northwest of northeast corner, marked by square gray stone, projecting 5 centimeters above ground, 20 centimeters square and 60 centimeters deep, the exact point marked by drill-hole in top True bearings northwest corner of stone house, 23° 04′.9, point of dome on St Minas, 159° 19′ 1, yellow minaret, 174° 26′ 3, cross on dome of St Constantine, 223° 30′ 5.

Larnaka, Island of Cyprus, 1922—Close reoccupation of C I W station of 1910, in central part of park owned by municipal government of Larnaka, south of city, 6 43 meters south of pine tree, 9 33 meters southeast of pine tree, and 5.93 meters east of eucalyptus tree, marked by tent-peg driven flush with ground True bearings minaret in town, 198° 20′ 1, southwest corner of powder-magazine wall, 342° 01′ 9

Naxos, Cyclades, 1922—On summit of peninsula forming part of north side of harbor, in midst of ruins of ancient Greek temple of which only massive marble portal remains standing, over center of more easterly of two marble disks, 145 centimeters in diameter, set horizontally in ground, 19 4 meters southeast of west edge of portal, and 19 3 meters south of east edge of portal True bearings tip of mountain across bay, 42° 19′ 6, cross on shrine on mountain side, 267° 09′ 2, flagstaff on square tower of Catholic church, 318° 15′ 9, cross on church south of village, 340° 42′ 8

Rhodes, Island of Rhodes, 1922—About 1 5 kilometers south of C I W station of 1910 unsuitable for reoccupation, about 200 meters south of signal-tower of steel lattice-work on summit of hill known as Mont

ISLANDS, MEDITERRANEAN

concluded

Rhodes, Island of Rhodes, 1922—continued
Smith, near center of third terrace below road following crest of hill, and south of path along north wall of terrace leading to group of small stone buildings occupied by Turkish family, 28 5 meters southeast of olive tree in northwest corner of terrace, 18 9 meters from next tree south, and 17 0 meters east of third tree, marked by tent-peg driven flush with ground True bearings east edge of semaphore tower, 194° 47′ 6, staff on low tower on ruined house, 200 meters, 291° 02′ 8, round brick chimney near sea, 296° 09′ 2, sharp point on tower on distant hill crest, 354° 12′ 2

ISLANDS PACIFIC OCEAN

BISMARCK ARCHIPELAGO

Rabaul, New Britain Island, 1921—Practical reoccupation C I W station of 1915, in copra plantation about one-third mile (0 5 km) south of large Nord Deutscher Lloyd jetty, at a point east of fourth row of coconut palms from shore and north of second row of palms north of road to swimming-pool, about 290 feet (88 meters) west of road running nearly parallel to shore, about 145 feet (44 meters) east of high-water mark, and 56 feet (17 meters) north of road leading to swimming-pool, marked by redwood board 1 by 4 by 12 inches (3 by 10 by 30 cm), left 1 inch (3 cm) above surface of ground True bearings right edge of north corner bath-house support, about 200 feet (61 meters) 76° 06′ 8, gable on middle large shed of 3 sheds across bay, about one and three-fourths miles (2 8 km), 107° 27′ 0, near gable of red shed across bay, about 2 miles (3 km), 139° 58′ 0, near gable of nearest metal copra-shed, about 350 feet (107 meters), 221° 43′ 8

COOK ISLANDS

Avarua (Rarotonga Range-Lights), 1922—About 1 kilometer east of C I W station of 1906, about 1 mile (1 6 km) eastward along beach from Avarua wharf, roughly in line with Puce Point range-lights, 134 6 feet (41 0 meters) east from base of sea range-light (green), and 125 8 feet (38 3 meters) west of base of land range-light (red), marked by cement pillar, 12 by 18 by 48 inches (30 by 46 by 122 cm), exact center of station being marked by bamboo pipe, and lettered "C I W 1922," left 6 inches (15 cm) above surface of coral beach True bearings left edge of shed on beach, about 1,000 feet (305 meters), 73° 12′ 8, left edge of Donnell's store, about 2 miles (3 km), 84° 51′ 5, right edge of Donnell's store, 85° 20′ 9, sea range-light, 95° 32′ 8, land range-light, 282° 31′ 0

Avarua B (Tekeu), 1922—On coral beach, about 1 mile (1 6 km) east of Avarua wharf, in grounds of Mr Tekeu's house and in range with its west veranda-posts, 72 feet (21 9 meters) north-northwest of center post of thatch hut near beach, 72 feet (22 meters) from high-water mark, 171 5 feet (52 27 meters) southeast of red or seaward range-light, and 265 5 feet (80 93 meters) west-southwest of center of C I W cement marker for *Rarotonga Range-Lights* station, marked by hardwood stake 2 by 4 by 8 inches (5 by 10 by 20 cm), with letters "C I W" cut on north face, and driven flush with sandy beach True bearings right edge of Donnell's store, about 2 miles (3 2 km), 86° 09′ 2, top of wireless-station antenna, about 5 miles (8 0 km), 86° 59′ 8, right edge of pier marking C I W *Rarotonga Range-Lights* station, 242° 00′ 5

ISLANDS, PACIFIC OCEAN

COOK ISLANDS—*concluded*

Avarua C (Coral Beach), 1922—On coral beach, about 1 mile (1 6 km) east of Avarua wharf, 911 feet (277.7 meters) east of base of red seaward range-light, about 800 feet (244 meters) east of C.I W *Rarotonga Range-Lights* station, 36 feet (11 0 meters) south of high-water mark, and 18 5 feet (5 64 meters) west of small iron-bark tree standing alone on beach, marked by a 4 by 3 by 36 inches (10 by 8 by 91 cm) hardwood post left 3 inches (8 cm) above surface, bearing "C.I W " cut in north face in 2-inch (5-cm) letters, and "C.I W " cut in top in 1.5-inch (4-cm) letters, middle period being exact center of station True bearings extreme top point of seaward range-light, 89° 26'.3

ELLICE ISLANDS

Funafuti Island, 1921—Two stations were occupied Station *A* is exact reoccupation of C I W station of 1915, on main island of Funafuti atoll, between beach and path to village, 112 3 feet (34.23 meters) north of north corner of wire fence surrounding office and residency and 27 1 feet (8.26 meters) from rock border of new path leading from residency to mission-house and village, marked by wooden stake flush with ground True bearings· center of flag-pole on governor's dock, 68° 10'.2, northwest extremity of Meulitefala Island, about 5 miles (8 km), 162° 08' 0, left edge of post on veranda of near corner of doctor's house, 227° 34'.8, far edge of post on east corner of veranda of office, 349° 20' 5

Station *B* is close reoccupation of C.I W station of 1915, on foreshore of coral beach, about one-fourth mile (0 4 km) northeast of Funafuti Island station *A*, 36 feet (11 0 meters) northwest of nearest point of path, about 55 feet (16.8 meters) southeast of nearest point of beach, 81 feet (24 7 meters) north-northwest of north corner of stone square inclosing graves, and 82 feet (25 0 meters) southwest of wire fence around Mr O'Brien's house, marked by round wooden peg driven flush with ground True bearing top of crane-mast on Allen's wharf, about 700 feet (213 meters), 52° 26' 0

Nanomana Island, 1921—Close reoccupation of C.I W station of 1915, on foreshore near landing-place on west coast of island, about 30 feet (9 meters) east of edge of sandy beach, and 121 feet (36 9 meters) west of southeast corner of base of flagstaff, marked by wooden peg driven flush with ground True bearings right edge of near corner of veranda of pastor's house, 220° 19'.2, near gable of church, 300 feet (91 meters), 250° 18' 7, southeast corner of flag-staff base, 263° 20' 7

Nanomea Island, 1921—About 250 feet (76 meters) east of C I W station of 1915 which could not be recovered because of growth of coconut trees, in center of path leading from landing-place on west side of island, 91 feet (27 7 meters) southwest of west corner of church, 76 feet (23 2 meters) northwest of north corner-post of pastor's veranda, and 52 4 feet (15 97 meters) and 49 3 feet (15 03 meters) respectively from east and north corners of base of flag-staff, marked by wooden stake 1 5 feet (0 45 meter) long and 2 inches (5 cm) in diameter driven flush with ground True bearings base of foundation at south corner of fourth hut beyond path intersecting path from landing-place, 220° 58'.0, west corner of church, 248° 56' 0, south corner of church, 290° 55' 9

ISLANDS, PACIFIC OCEAN

ELLICE ISLANDS—*concluded*

Niutao Island, 1921—Close reoccupation of C I W station of 1915, on southwest coast on sandy beach in front of group of huts near church, in line with northwest side of hut which stands about 50 feet (15 meters) southeast of pastor's house, 79 feet (24 1 meters) southwest of west corner of same hut, 89 feet (27 1 meters), 71 feet (21 6 meters), and 110 feet (33 5 meters) respectively from east, south, and west corners of pastor's house, and 156 feet (47 5 meters) southeast of flagstaff; marked by wooden peg driven just below surface of ground True bearings right edge of door of church, 206° 02' 1, west corner of hut to southeast of pastor's house, 229° 08' 1

Nui Island, 1921—Close reoccupation of C I W station of 1915, near landing-place on west shore of island, 101 feet (30 8 meters) north of stone base of white flagstaff, 74 feet (22 6 meters) south of point where black flagpole stood in 1915, 71 feet (21 6 meters) southwest of northwest corner of large meeting-house and post-office, 33 feet (10 1 meters) northwest of southwest corner of meeting-house, 142 0 feet (43.28 meters) northwest of northeast corner of meeting-house southeast of flagstaff, 13 6 feet (4 15 meters) southeast and 6 feet (1 8 meters) northeast respectively of coconut trees, marked by wooden peg driven flush with ground True bearings northwest corner of foundation of large meeting-house, 201° 22' 7, northeast corner of foundation of meeting-house southeast of flagstaff, 330° 54' 7, left top of base flagstaff, 348° 59' 6

Nukufetau Island, 1921—About 75 feet (22.9 meters) west of station of 1915 now submerged by encroachment of sea, on sandy foreshore of beach, in front of village at north end of island, 88 9 feet (27 10 meters) northeast of northwest corner of base of flag-staff, 60 6 feet (18 47 meters) east-southeast of south-east corner of jail, 76 feet (23.2 meters) southeast of northeast corner of jail, and about 50 feet (15 meters) from edge of foreshore, marked by a wooden peg driven flush with ground True bearings point 4 inches (10 cm) above lower northwest corner of base of flagstaff, 12° 36' 1; extremity of near end of first island to right of village, 320° 48' 7

Nukulailai, 1921—Close reoccupation of C I.W. station of 1915, on northwest shore of island, 49 feet (14.9 meters) east of mean high-water mark, 109 feet (33.2 meters) north of northwest corner of stone base of flagstaff, 142 feet (43.3 meters) west of nearest point of path leading to pastor's house, and about 500 feet (152 meters) southwest of church, marked by a triangular-shaped stake driven flush with ground True bearings northwest base of flagstaff, 8° 47'.3, south-east corner of base of church, 254° 32' 8

Vaitupu Island, 1921—Close reoccupation of C I W station of 1915, on foreshore, about 600 feet (183 meters) south of flagstaff at landing-place on west side of island, 100 feet (30 meters) west of roughly defined path leading from landing-place to south side of island, and 211 6 feet (64.50 meters) southwest of store, marked by wooden peg driven flush with ground. True bearings northern extremity of Vaitupu Island, 150° 04' 7, near end of gable on store, 204° 49' 6

FIJI ISLANDS

Lautoka, Viti Levu Island, 1921—On grounds of Colonial Sugar Refining Company, about one-fourth mile (0 4 km.) east of wharf, in center of path leading

ISLANDS, PACIFIC OCEAN

FIJI ISLANDS—*concluded*

Lautoka, Viti Levu Island, 1921—continued from wagon-bridge to coal-yard, 80 3 feet (24 48 meters) south-southeast of second tree along road west of wagon-bridge, and 286 5 feet (87 32 meters) southwest of inner southwest corner of cement foundation of wagon-bridge True bearings lone palm tree on top of red clay hill to rear of sugar-mill, 2 miles (3 km), 6° 52′ 4, right edge of south wagon-bridge rail, 240° 22′ 9, right top edge of highest mountain visible from station, 310° 19′ 9, left edge of tall brick smoke-stack on sugar-mill, 1,000 feet (305 meters), 346° 05′ 5

Suva, Dr Klotz's Station, Viti Levu Island, 1921—Exact reoccupation of C I W station of 1915, on reserve fronting harbor, about 70 feet (21 meters) and 100 feet (30 meters) south of south and east corners respectively of cable station, and 68 feet (21 meters) west of north corner of balcony of town hall, marked by earthenware drain-pipe 15 inches (38 cm) in diameter set by Survey Department, 52 feet (15 8 meters) from town hall True bearings beacon on Lami River reef, one and one-fourth miles (2 0 km), 138° 24′ 5, finial on lower lighthouse, 150° 15′

HAWAIIAN ISLANDS

Sisal, Honolulu Magnetic Observatory, Oahu Island, 1921 —Observations were made on *Pier A* in absolute house, Honolulu Magnetic Observatory, of United States Coast and Geodetic Survey, and station *A* was exactly reoccupied. Station *A* is outside observatory inclosure, 18 46 meters north of *Pier A* in line with north meridian-mark which is distant 2,800 feet (853 meters), on level coral plain 6 4 meters north of stone wall surrounding inclosure, marked by wooden peg with copper tack at precise point True bearings trigonometric staff on mountain, 148° 30′ 5, V-cut in mountain, 160° 02′ 3, north meridian-stone, 180° 00′ 0

LORD HOWE ISLAND

Lord Howe Island, 1923—Approximate reoccupation of C I W station of 1915, on top of small lone knoll east of Watson's Landing, on south side of island, 55 feet (16 8 meters) southeast of near corner of sheet-iron boat-shed, and about 30 feet (9 1 meters) from near edge of sandy beach along lagoon True bearings right edge of top section of signal flagpole at Watson's Landing, 300 feet (91 meters), 123° 06′ 9, left edge of top section of common flagpole, 200 feet (61 meters), 212° 54′ 0

MALAY ARCHIPELAGO

Bandjermasin, Borneo, 1923—Close reoccupation of Batavia Observatory magnetic station of 1918 In grounds of Hotel Bandjer between tidal canal and driveway leading to rear of hotel, 11 6 feet (3.54 meters) east of first coconut tree southwest along canal from rear hotel building west of drive, 53 6 feet (16 34 meters) southwest of west corner of same building, and 66 5 feet (20 27 meters) and 60 feet (18 3 meters) respectively, west of north and west corners of rear hotel building east of drive True bearing left edge of white fence across canal, 500 feet (152 meters), 59° 02′ 0

Jesselton, British North Borneo, 1923—About 5 miles (8 km) west of town, upon golf course, near east edge of first rise in front of golf pavilion, 35 feet (10 7 meters) east of center golf-hole of green No 9, 75 6 feet (23 04 meters) south of rubber tree numbered 332, and 40 6 feet (12 37 meters) west of rubber tree numbered 320, marked by wooden tent-peg driven just below turf True bearings center of veranda gable on paymaster's house, one-fourth mile (0 4 km), 23° 36′ 1, right edge of north concrete pier of school, one-fourth mile (0 4 km) 72° 47′ 5, left edge of governor's house, one-fourth mile (0 4 km), 211° 28′ 6, right edge of lone house on hill, one-half mile (0 8 km), 317° 39′ 3

Kudat, British North Borneo, 1923—On police parade-ground, about 1,000 feet (305 meters) west of wharves, west of tennis-court, 24 5 feet (7 47 meters) east of south post of east football goal and in line with south posts of both football goals, 121 6 feet (37 06 meters) south of base of official flagstaff mounted on concrete cylinder, 59 0 feet (17 98 meters), and 78 2 feet (23 84 meters) from northwest and southwest corners respectively of white wooden fence surrounding tennis-court

Labuan, Labuan Island, 1923—On large open plot in front of government rest-house, 134 feet (40 8 meters) east of east edge of stone breakwater, and 305 6 feet (93 1 meters) south of southeast corner and in line with east side of rest-house, marked by wooden stake 1 5 inches (3 8 cm) in diameter and 24 inches (61 cm) long, driven flush with ground True bearings near corner of government English school, 147° 35′ 4, right edge of rest-house, 198° 47′ 8, gable of house on point, 5 miles (8 km), 313° 09′ 9, top of harbor-beacon, 1 mile (1 6 km), 348° 58′ 9

Makassar, Celebes, 1923—Close reoccupation of magnetic station of Royal Magnetical and Meteorological Observatory, Batavia, Java In north end of park, opposite Oranje Hotel, 125 feet (38 1 meters) south of black and white iron telegraph-pole which is in range with tree and west wall of east wing of hotel, and 204 feet (62.2 meters) southwest of base of flagstaff in northeast park corner True bearings center of gable on base of monument surrounded by iron fence, 94° 13′ 8, top of spike of wind-vane on church spire, 500 feet (152 meters), 285° 50′ 1, near spike on gable of lone house in park, 900 feet (274 meters), 358° 18′ 4

Sandakan, British North Borneo, 1923—About 5 miles (8 km) from town, on links of Sandakan Golf Club, north of road, on narrow strip of ground bounded on north, east, and south by gully, 259 feet (78 9 meters) west of hole in golf-green No 6, and 398 feet (121.3 meters) north of hole in golf-green No 3, marked by tent-peg driven flush with ground True bearings top of insulator on telegraph-pole on hill south of road and near top of east flight of steps, 0° 37′ 4, right edge of concrete pier of golf club-house near roadside, 58° 05′ 4, right edge of wireless mast, one-half mile (0 8 km), 89° 17′ 7, right edge of house with thatch roof, 500 feet (152 meters), 230° 33′ 4

Weltevreden (Batavia), Java, 1923—Intercomparison observations were made in absolute house of Royal Magnetic and Meteorological Observatory Declination observations were made on declination pier *D*, horizontal intensity on piers *A* and *C*, and inclination on inclination pier *E*

MARQUESAS ISLANDS

Atuona, Hiva Oa Island, 1922—On Noire Point near Taa Hu Ku Harbor, on summit of ridge between harbor and village of Atuona, near center of rough semi-

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MARQUESAS ISLANDS—*concluded*

Atuona, Hiva Oa Island, 1922—continued
circle of about 300 feet (91 meters) radius formed by road around Noire Point and about 200 feet (61 meters) above sea-level, marked by wooden tent-peg True bearings gable of white copra-shed near Teachoa Point, about 3.5 miles (5.6 km), 40° 07′.9, near corner of Maxwell's store, about three-fourths mile (1 km), 260° 03′.2, lone rock at extreme right of Motane Island, 25 miles (40 km), 314° 34′.0

Puamau, Hiva Oa Island, 1922—About 500 yards (457 meters) east of Catholic mission, on Puamau or Perigot Bay, about 100 feet (30 meters) east of westernmost edge of rock ledge lying between coral beach and sea, about 25 feet (8 meters) from base of high cliff, and in center of trail running along shore to east of Puamau village, marked by tent-peg driven flush with ground True bearings cross on Catholic church seen over barn, about one-fourth mile (0.4 km), 93° 21′.7, north gable of Protestant church, about one-half mile (0.8 km), 120° 49′.1, near gable of south copra-shed, 261° 13′.2

NEW CALEDONIA (INCLUDING LOYALTY ISLANDS)

Bouraïl, 1922—Close reoccupation of C I W station of 1915, on north shore of Bourail River, near its mouth, 121 feet (36.9 meters) north-northeast from beacon-shed with V-shaped wind-shields, and about 270 feet (82 meters) northwest of small stone jetty, marked by a 4.5 by 3 by 24 inch (11 by 8 by 61 cm) hardwood, wedge-shaped post left flush with surface of ground True bearings top of near beacon, 25° 09′.2, top of lighthouse across bay, three-fourths mile (1.2 km), 138° 40′.0, right gable of Port de Mei, 300 feet (91 meters), 252° 46′.4, right edge of post on jetty at ground, 270 feet (82 meters), 300° 43′.1.

Chepenehe, Lifu Island, 1922—See Lifu Island

Keppanie, Lifu Island, 1922—See Lifu Island

Lifu Island (Keppanie), 1922—Close reoccupation of C I W station of 1915, 156.5 feet (47.70 meters) northwest of top step of landing-place in northeast corner of Sandal Bay, on west coast of Lifu Island, on concave top of small mound about 26 feet (7.9 meters) northeast of small lagoon forming natural landing harbor, and in line with two permanent benches along water-front, marked by a 5 by 5 by 18 inch (13 by 13 by 46 cm) cement block marked on top with letters "C I W 1922," left 1 inch (3 cm) above ground True bearings left edge of Protestant church across bay, 10 miles (16 km), 11° 09′.7, statue on Mekitapune Church, 3.5 miles (5.6 km), 76° 36′.2, left edge of belfry of Eacho Church, 1.5 miles (2.4 km), 102° 28′.4, near edge of yellow lime building used as post-office, 600 feet (183 meters), 159° 42′.3, top of right gate-post in front of missionary's house, 450 feet (137 meters), 205° 05′.4, spike on gable of house, 900 feet (274 meters), 268° 05′.8

Maré Island (Tatyn), 1922—Close reoccupation of C.I W station of 1915, on flat open space used by natives as a playground, about one-half mile (0.8 km) along road running north from landing-place in Tatyn Bay, on west coast of Maré Island, 63 paces west of mouth of lime-oven and 10 paces east of rough lime pillar used as channel marker and in line between the two, and 46 paces south of southwest corner of wooden fence around coconut grove No bearings were measured, those of 1915 were extreme edge of cliff at south end of bay, 8 miles (13 km), 32° 09′, extreme edge of cliff at north end of bay, 3.5 miles (5.6 km), 119° 06′, near gable of residency, 1 mile (1.6 km), 352° 02′

Noumea, 1922—Close reoccupation of C I W station of 1915, in valley east of zigzag road leading from town up to signal-station, 132 feet (40.2 meters) east of lamp-post standing in road about 200 feet (61 meters) above its last sharp turn, and 90.6 feet (27.62 meters) west up hill from a survey peg standing 3 inches (8 cm) above surface of ground, marked by hardwood post 5 inches (13 cm) in diameter, with cone top left 4 inches (10 cm) above ground and covered with a cairn of stones True bearings top of center beacon-pole on hill, 1,000 feet (305 meters), 19° 13′.8, base of flagpole at signal-station, three-fourths mile (1.2 km), 173° 44′.5, near gable of hospital on hill, 1.5 miles (2.4 km), 308° 42′.6, spike on center of front of military barracks, 1.5 miles (2.4 km), 328° 59′.8

Paagoumene, 1922—Exact reoccupation of C I W station of 1915, on plain west of winding sheds and buildings of Chrome Mining Company, in line with northwest fence of cemetery, 121.7 feet (37.10 meters) northeast of north corner-post of cemetery fence, and 176 feet (53.6 meters) north-northeast of east corner-post of cemetery fence, marked by wooden post projecting about 3 inches (8 cm) above ground and covered with cairn of stones, to be replaced by a cement pier True bearings top of beacon-pole on hill, one-half mile (0.8 km), 44° 43′.8; top of north corner of cement tombstone marking a Japanese grave at east end of second row of tombs, 130 feet (40 meters), 47° 40′.6

NEW GUINEA

Buna Bay, 1922—Practical reoccupation of C.I W station of 1915, on foreshore, about 900 feet (274 meters) northeast of jetty, 135 feet (41.1 meters) northwest of near edge of path from jetty to residency running nearly parallel to shore, and 90 feet (27.4 meters) from high-water mark True bearings right center post on veranda of B N G store about one-half mile (0.8 km), 47° 09′.2, extreme point of land to left of Buna Bay, about 3 miles (5 km), 130° 12′.4, spike on porch of Mr Oates's house, about 450 feet (137 meters), 350° 42′.0

Cape Nelson, 1922—Close reoccupation of C I.W station of 1915, at extremity of steep cliff about 500 feet (152 meters) east of jetty, 75 feet (23 meters) south of base of flagpole in front of residency, and about 33 feet (10 meters) southeast of nearest point of zigzag path leading from jetty up face of cliff to residency True bearings east gable of easternmost B N G hut across bay, about 1 mile (1.6 km), 12° 44′.8; tower beacon on side of hill, about 1 mile (1.6 km), 70° 20′.3, left corner of residency porch at roof, 138 feet (42.1 meters), 162° 11′.3

Ipoteto Island, 1922—Close reoccupation of C I W station of 1915, about 20 feet (6 meters) from high-water mark at southeastern extremity of island, on sandy spur, 9 feet (3 meters) from each of two trees which are 5 feet (1.5 meters) apart

Kwato Island, 1921—Close reoccupation of C I W station of 1915, on south side of island, at east end of flat, northeast of jetty and boat-shed, 60 feet (18.3 meters) northwest of high-water mark, 35 feet (10.7

ISLANDS, PACIFIC OCEAN

NEW GUINEA—*concluded*

Kwato Island, 1921—continued
meters) southeast across small spring from tree with dense foliage, and 37 feet (11 3 meters) southwest from westernmost coconut palm of four at eastern end of flat True bearings left edge of flagpole seen over shed, about 550 feet (168 meters), 50° 48′ 0, right end gable of mission store, about 300 feet (91 meters), 71° 53′ 0, point on extreme end of Cape Rogie, about 2 miles (3 km), 308° 55′ 0

Mambare, 1922—Close reoccupation of C I W station of 1915, on foreshore near landing-place, about 250 feet (76 meters) northwest of government hut, 15 feet (4 6 meters) south of mean high-water mark, and 15 feet (4 6 meters) from edge of low grassy swamp which is filled at high tide True bearings extremity of Warsong Point, about 2 5 miles (4 km), 146° 57′ 3, left edge of boatshed, about one-half mile (0 8 km), 233° 44′ 5, near corner of government hut seen over swamp, 302° 13′ 1

Samarai, 1921—Two stations were occupied Station *A* is close reoccupation of C I W station of 1915, at northern apex of equilateral triangle the base of which is made by two breadfruit trees 32 6 feet (9 94 meters) apart, near middle of northern end of narrow southern portion of recreation reserve True bearings right gable of near police quarters, 0° 33′ 2, right gable of far police quarters, about 300 feet (91 meters) 8° 48′ 3, left corner of roof of pavilion about 220 feet (67 meters), 93° 30′ 6, near corner of Robinson's monument, about 450 feet (137 meters), 162° 05′ 8, near gable of house, about 210 feet (64 meters), 263° 17′ 8

Station *B* is practical reoccupation of C I W station of 1915, on northeast side of island, about one-fourth mile (0 4 km) along path running from jetty southeastward around edge of island True bearings left edge of shed on end of jetty, 141° 39′ 4, right end of house with metal roof across bay, about 4 miles (6 km), 279° 34′ 5

Suau Island, 1921—Within one-half mile of C I W Suau Harbor station of 1915, on northeastern side of island, near landing-place, 70 feet (21 3 meters) south of high-water mark, 43 feet (13 1 meters) north of near base of stone wall running along foreshore in front of village, and 45 feet (13 7 meters) east-northeast of center of double tree True bearings inner edge of post of roof of hut, 140 6 feet (42 85 meters), 28° 09′ 5, lone tree on extremity of point across bay, about 2 miles (3 km), 84° 41′ 8, left edge of near corner of native hut, 341° 33′ 9

Tamata Junction, 1922—At head of navigation of Tamata Creek, southeast of landing-place at Whitton's old store, in thick swamp grass on top of first point of high bank projecting into creek, 130 6 feet (39 81 meters) southeast of southeast corner of Whitton's old store, 18 7 feet (5 70 meters) south-southeast of small softwood tree on river bank, and 34 6 feet (10 55 meters) northeast of large softwood tree, marked by 18-inch (46-cm) round hardwood stake driven flush with ground True bearings inner side of ornament on left end of Whitton's old store, 115° 49′ 1, right edge of northeast corner veranda-post on store, 139 feet (42 37 meters), 130° 39′ 8

NEW HEBRIDES

Fila, Sandwich Island, 1922—Close reoccupation of C I W station of 1915, near top of hill at rear of post-office building, 111 feet (33 8 meters) northeast of northwest corner of wire fence surrounding

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NEW HEBRIDES—*continued*

Fila, Sandwich Island, 1922—continued
Protestant church and British residency offices, 93 feet (28 3 meters) north of nearest point of same fence, 25 feet (7 6 meters) north of center of tree, and 53 5 feet (16 31 meters) southeast of northeast corner post of fence at rear of post-office, marked by a 6 by 6 by 18 inch (15 by 15 by 46 cm) cement pier with "C I W 1922" on top, a hole marking exact station center, left level with ground True bearings ornament on front steeple of Protestant church, 600 feet (183 meters), 1° 55′ 2, right edge of house, 600 feet (183 meters), 21° 14′ 2, center of lower section of flagpole at British residence, 1 5 miles (2 4 km), 52° 59′ 5, right edge of post-office building, 800 feet (244 meters), 88° 46′ 2, center of top of lower section of flagpole in front of French offices, 800 feet (244 meters), 168° 04′ 9

Hog Harbor, Santo Island, 1923—On west shore of Hog Harbor near landing-place of mission station, between native and mission boat-houses and beach, 20 feet (6 1 meters) and 23 feet (7 0 meters) from the nearest corners of these houses respectively, and 23 6 feet (7 19 meters) from near wooden rail of track leading to mission boat-house, among coconut trees, one in direct line to nearest point on beach being distant 25 feet (7 6 meters) and one on line passing between boat-houses being distant 15 feet (4 6 meters), marked by stake 2 by 3 by 24 inches (5 by 8 by 61 cm) driven flush

Luganville, Santo Island, 1922—On beach at right of Balland and Son's jetty, in clearing between manager's house and sea, in line with south face of first store building southeast of large copra-shed, and in line with and 105 feet (32 0 meters) southeast of right edge of left brick steps leading to veranda of manager's house, marked by broken tent-peg driven flush with ground True bearings right edge of left brick steps leading to manager's house, 144° 45′ 9, near gable of house to rear of second store, 500 feet (152 meters), 231° 53′ 6, right edge of store front, taken near ground, 600 feet (183 meters), 258° 03′ 0, right edge of next to last stone pier of jetty, 800 feet (244 meters), 292° 54′ 2

Ringdove, Epi Island, 1922—Near beach south of landing-place in front of Zeitler and Hagen Plantation store, 108 5 feet (33 07 meters) south along beach from flagpole, in line with and 88 feet (26 8 meters) west of right edge of Mr Hagen's residence, marked by tent-peg left 1 inch (3 cm) above ground, to be replaced by hardwood peg and cement True bearings left edge of Protestant mission on island across harbor, 3 miles (5 km), 158° 06′ 6, right edge of Mr Hagen's residence, 289° 19′ 4

Vila, Sandwich Island, 1922—See Fila

SAMOA ISLANDS

Apia, Samoa Observatory, Upolu Island, 1921—Five stations were occupied, two in absolute observatory, *N Pier* and *SE Pier*, and three in observatory grounds, *West Pier*, *A*, and *B* Station *A* is 50 51 feet (15 40 meters) from northwest corner and 48 53 feet (14 80 meters) from southwest corner of concrete base of atmospheric-electric laboratory, 26 82 feet (8 17 meters) north of rain-gage and 25 87 feet (7.89 meters) southeast of near corner of meteorological shelter, marked by cement post 7 by 7 by 30 inches (18 by 18 by 76 cm) True bearings church steeple across bay, 43° 28′ 8, church steeple across bay, 95° 46′ 6, gable of house on Faleulı Point, 114° 01′ 2,

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SAMOA ISLANDS—*concluded*

Apia, Samoa Observatory, Upolu Island, 1921—cont'd northeast corner of Gauss House in Observatory grounds, 340° 23′.0

Station *B* is 50.32 feet (15.34 meters) south 95° 46′.6 west of station *A*, in line with *A* and church steeple, 51.12 feet (15.58 meters) from rain-gage, and 26.10 feet (7.96 meters) from square pier north of absolute observatory, marked by brass-bound tripod pegs

Pago Pago, Tutuila Island, 1921—Close reoccupation of C I W station of 1911 and 1916, on parade-ground of Fita-Fita barracks at United States naval station in Pago Pago Harbor, at a point 162.6 feet (49.56 meters) west of bottom of northwest edge of jail, and 55.5 feet (16.92 meters) northeast of northwest corner of enlisted men's barracks, marked by a peg driven flush with ground True bearings northeast edge of old schoolhouse, 127° 12′.1, center of base of flagstaff on Poyer school, 192° 49′.0, northwest edge of pillar on wireless house, 219° 54′.0, southwest edge of jail, 269° 08′.1 The enlisted men's barracks have an iron roof, and have been erected since the previous occupation

Tau, Manua Island, 1921—Close reoccupation of C I W station of 1911, about 40 yards (36.6 meters) southwest of point where old flagpole stood, about 500 feet (152 meters) south of ruins of Queen Vaitupu's house, about 219 feet (66.8 meters) northeast of southeast edge of ruins of small house, 26.0 feet (7.92 meters) northwest of breadfruit tree, and 73.5 feet (22.40 meters) southwest of center post of native hut True bearing top of shaft on tomb of Queen Margaret, 352° 01′.4

SOCIETY ISLANDS

Papeete, Tahiti Island, 1922—Close reoccupation of C I W station of 1916, in eastern corner of government land used as experiment tract, just south of Botanical Garden, about 107 meters southeast of gardener's house, 56 meters northeast of ruins of windmill pump, 47 meters southeast of north fence, 15.2 meters west of east fence, and 9.4 meters north and 6.1 meters south respectively of two coconut trees Declination observations were made at a secondary station 20 feet (6.1 meters) southeast of principal station True bearing from secondary station right edge of south wooden window in gardener's house 146° 05′.0

Point Fareute, Tahiti Island, 1922—Two stations were occupied, both being close reoccupations of former C I W station *A*, occupied in April, is on coral beach, east of site of old arsenal on Point Fareute, 360 feet (109.7 meters) north of northeast corner of iron bridge across stream, and 60 feet (18.3 meters) east of present changeable mouth of small stream True bearings north gable of yellow house, 28° 05′.4, near corner of same yellow house, 32° 02′.9

Station *B* occupied in June, is somewhat eastward of A which could not be recovered on account of shifting sand True bearing north gable of yellow house, 30° 55′.8

SOLOMON ISLANDS

Aola, Guadalcanar Island, 1921—In grounds of residence of Aola District Commissioner, 143.8 feet (43.83 meters) northeast of base of flagpole and in range with flagpole and north corner of residence sleeping-room, 133.5 feet (40.69 meters) east-southeast of east extension wall of large meeting-hut, 111.7 feet (34.05 meters) southeast of near concrete post on edge of meeting-house shore path, and 34 feet (10.4 meters) northwest of base of near hedge along residence path to shore, marked by long tent-peg, to be replaced by cement marker by District Commissioner True bearings base of flagpole in residence yard, 35° 43′.3, gable of easternmost copra-shed on Barra Island, about 2 miles (3.2 km), 253° 13′.6, left gable of house on Lever's Point, Guadalcanar Island, about 1.5 miles (2 km), 266° 16′.5

Binskin's Station, Binskin's Island, 1921—Probably within 10 feet (3 meters) of C I W station of 1915, near southeast corner of small island occupied by Mr Binskin, about one-half mile (0.8 km) east of Bagga Island, on narrow coral path lined with coconut trees running parallel with east shore of island, 110.2 feet (33.59 meters) northeast of north corner of easternmost copra-shed with tin roof, 115.8 feet (35.30 meters) north-northeast of east corner of same shed, 66.5 feet (20.27 meters) north-northwest of center of easternmost coconut tree in line with inner edge of path, and 45 feet (13.7 meters) west-southwest of nearest point of sea-wall, marked by small wooden peg flush with ground, to be replaced by cement marker True bearings near gable of copra-shed on inner side of path near pier, about 700 feet (213 meters), 129° 25′.2, spike on top of roof on Mr Binskin's house, about 800 feet (244 meters), 143° 26′.9, tall tree on Fairway Island, about 1 mile (1.6 km), 330° 37′.6

Faisi Island, 1921—Close reoccupation of C I W station of 1915, on southeast side of path leading from wharf to native quarters, 270 feet (82.3 meters) northeast of near end of store building, and 18 feet (5.5 meters) from near edge of path, marked by wooden peg driven flush with ground True bearings north gable of lone hut on Shortland Island, about three-fourths mile (1 km), 39° 22′.9, north edge of near roof of Burns, Philp and Company's store, about 275 feet (84 meters), 58° 24′.5, right edge of center post under house on hill, 250 feet (76 meters) 138° 08′.2, south edge of south porch post of native quarters, about 700 feet (213 meters), 235° 23′.2, near gable of lone hut on Poporang Island, about 1 mile (1.6 km), 322° 22′.3

Gizo, 1921—In the immediate vicinity of C I W stations *A* and *B* of 1915, neither of which could be identified, on coral path running eastward from wharf and store of Burns, Philp and Company toward government offices, between first and second small streams crossing path after leaving wharf, 139 paces southeast of metal copra-shed, 188 feet (57.3 meters) northwest along path from inner west edge of foundation of foot-bridge over small stream with flood-gate, 10 feet (3.0 meters) north and 5 feet (1.5 meters) south respectively from base of hedge fence bordering path, and 26 feet (7.9 meters) east of center of prominent curved coconut palm standing in path True bearings ornament on near gable end of shed on Shelter Island, about 2 miles (3 km), 187° 22′.8

Makambo Island, 1921—Exact reoccupation of C I W station of 1915, at foot of hill northeast of wharf, 98 feet (29.9 meters) west of southwest corner of

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SOLOMON ISLANDS—*concluded*

Makambo Island, 1921—continued
tennis-court, in line with east side of shed used for native quarters, and 171 feet (52 1 meters) north-northeast of its northeast corner, marked by wooden peg driven flush with ground True bearings top of wireless mast at Tulagi, about 1¾ miles (2 8 km), 23° 19′ 8, near gable of Chinaman's store, about 300 feet (91 meters), 133° 54′ 8

Rere, Guadalcanar Island, 1921—On mainland of Guadalcanar Island, on Gibson's Plantation, about 300 feet (91 meters) southwest of southwest corner of copra-shed at landing-place, 68 feet (21 meters) south of high-water mark, and 98 feet (29 9 meters) east of northeast corner and in line with north side of native hut True bearings extreme edge of shore of harbor to left, about 2 5 miles (4 km), 130° 44′ 5, near corner of small white house on small island across bay, about 3 miles (5 km), 173° 03′ 7, near gable of copra-shed at landing-place, 231° 17′ 5

Salicana Island, Manning Strait, 1921—Close reoccupation of C I W station of 1915, on south shore of island, about 250 feet (76 meters) west of new jetty, in center of narrow trail running west from jetty along foreshore, about 75 feet (23 meters) west along trail from westernmost tidal stream, about 5 feet (2 meters) east of point where trail enters bushes, and about 5 feet (2 meters) from high-water mark, marked by wooden peg driven flush with ground True bearings near gable of thatch hut behind copra-shed, about 400 feet (122 meters), 256° 39′ 2, tall tree on small reef, about 1 5 miles (2 4 km), 287° 52′ 2

Tulagi, 1921—Close reoccupation of C I W station of 1915, near western end of shelf between high cliffs and shore-line, about one-fourth mile (0 4 km) along path westward of jetty, within second indenture of cliff from jetty, about 300 feet (91 meters) east of Hollise Brothers' engineering works, about 300 feet (91 meters) northeast of government offices located on high cliffs, 21 feet (6 4 meters) southeast of road, 30 feet (9 1 meters), 43 feet (13 1 meters), 39 8 feet (12 1 meters), and 30 feet (9 1 meters) respectively, from centers of coconut trees northwest, west-northwest, southwest, and southeast, and 18 4 feet (5 61 meters) west of third concrete road-marker from post-office, marked by a 2 by 3 by 24 inch (5 by 8 by 61 cm) hardwood stake, with arrow cut in north side, left 1 inch (3 cm) above surface of ground True bearings ornament on near gable end of Mr Laycock's house on hill, about three-fourths mile (1 km), 143° 32′ 3, gable on right end of large shed on Makambo wharf, about one and three-fourths miles (2 8 km), 200° 45′ 1, center of flagstaff on near gable of storekeeper's house on top of hill on Makambo, one and three-fourths miles (2 8 km), 213° 31′ 1, left leading-beacon, about 2 miles (3 2 km), 235° 19′ 8, right leading-beacon, about 2.5 miles (4 km), 261° 47′ 1

TOKELAU ISLANDS

Atafu Island, 1921—Close reoccupation of C I W station of 1915, on coral beach in front of pastor's house at south end of island, 191 feet (58 2 meters) southwest of flagpole seen through trees, and 217 feet (66 1 meters) southwest of west corner of veranda of pastor's house, marked by a wooden peg driven flush with ground

Fakaofu Island, 1921—Close reoccupation of C I W station of 1915, near northern extremity of island, at center of northeast corner of path around island near shore, in line with and 7 feet (2 1 meters) from inner western edge, 15 3 feet (4 66 meters) south of south-west corner of hut, 40 6 feet (12.37 meters) and 49 9 feet (15 21 meters) respectively from west and south corners of hut to northeast, and 25 feet (7 6 meters) and 30 feet (9 1 meters) respectively from north and west corners of hut to east, marked by a wooden peg 2 inches (5 cm) in diameter driven just below surface of path True bearings west corner of hut, 235° 01′ 7, lone tree across lagoon, 5 miles (8 km), 299° 15′ 5

Swain's Island, 1921—Close reoccupation of C I W station of 1915, on west coast of island near landing-place, 20 paces north of lone coconut tree in line with kausunu tree at landing-place, about 300 feet (91 meters) east of high-water mark, and about 700 feet (213 meters) northwest of new copra-drying shed True bearings gable of near end of copra-shed, 318° 52′ 8, outer edge of top window in copra-shed, 319° 26′ 0

TONGA ISLANDS

Neiafu, Vavau Island, 1921—Close reoccupation of C I W station of 1915, on grass plot in front of Free Church and northeast of jetty, 50 5 feet (15 39 meters) northwest from north corner of pier marking station of Australian Eclipse Expedition of 1911, 192 feet (58 52 meters) from point on church fence in range with church belfry and 50 5 feet (15 39 meters) north from westernmost tree of a row standing east and west, next tree of row being a few feet southeast of eclipse-pier, marked by peg driven flush with surface of ground True bearings near corner of Burns, Philp & Co store, 16° 36′ 2, right edge of chimney on house near landing-place, 85° 49′ 4, spike on house north of station and across road, 153° 45′ 0, outer southeast leg of cement belfry in front of church at height of church fence, 216° 13′ 2

Nukualofa, Tongatabu Island, 1921—Close reoccupation of C I W station of 1915, on grass plot at rear of post-office, in range between south corner of post-office and easternmost tree of third row of trees standing parallel to shore, 139 5 feet (42 52 meters) southwest of west corner of post-office wall, 168 3 feet (51.30 meters) southwest of south corner of post-office wall, and 25 2 feet (7 68 meters) east-northeast of tree referred to, marked by a 2 by 4 inches (5 by 10 cm) beveled survey-peg, which is to be replaced by a cement block flush with ground, the position to be entered on official records of island survey True bearings left ornament on roof of store behind treasury, about 900 feet (274 meters), 43° 34′ 4, left edge of iron rail around signal-pole, about 300 feet (91 meters), 190° 07′ 1, base of west corner of wall of post-office, 240° 02′ 1, base of south corner of wall of post-office, 257° 22′ 1, ornament on far gable of Victoria Memorial Hall, 900 feet (274 meters), 354° 20′ 4

TUAMOTU ARCHIPELAGO

Angatau Island, 1922—Near landing-place on northwest side of island, on coral foreshore, 183 3 feet (55 87 meters) west of Mr Marshall's copra-shed seen through coconut trees, about 200 feet (61 meters) from present high-water mark on coral beach, and about 20 feet (6 meters) west of young coconut trees True bearings lone post seen on beach, about 600 feet (183 meters), 204° 36′ 1, near gable of

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TUAMOTU ARCHIPELAGO—*continued*

Angatau Island, 1922—continued

Mr Marshall's copra-shed seen through trees, 232° 51′ 3

Fakahina Island, 1922—Near landing-place on northwest side of island, about 250 feet (76 meters) south-southwest of navigation light-pole, and 75 feet (23 meters) from high-water line of coral beach True bearing left edge of base of navigation light-pole seen over young coconut trees, 197° 00′ 9

Puka Puka Island, 1922—Near landing-place on north side of island, on coral foreshore, 30 paces from high-water line, and 142 paces southwest of hut near flag-pole True bearing near gable of hut near flagpole, 234° 57′.8

ISLANDS, PACIFIC OCEAN

TUAMOTU ARCHIPELAGO—*concluded*

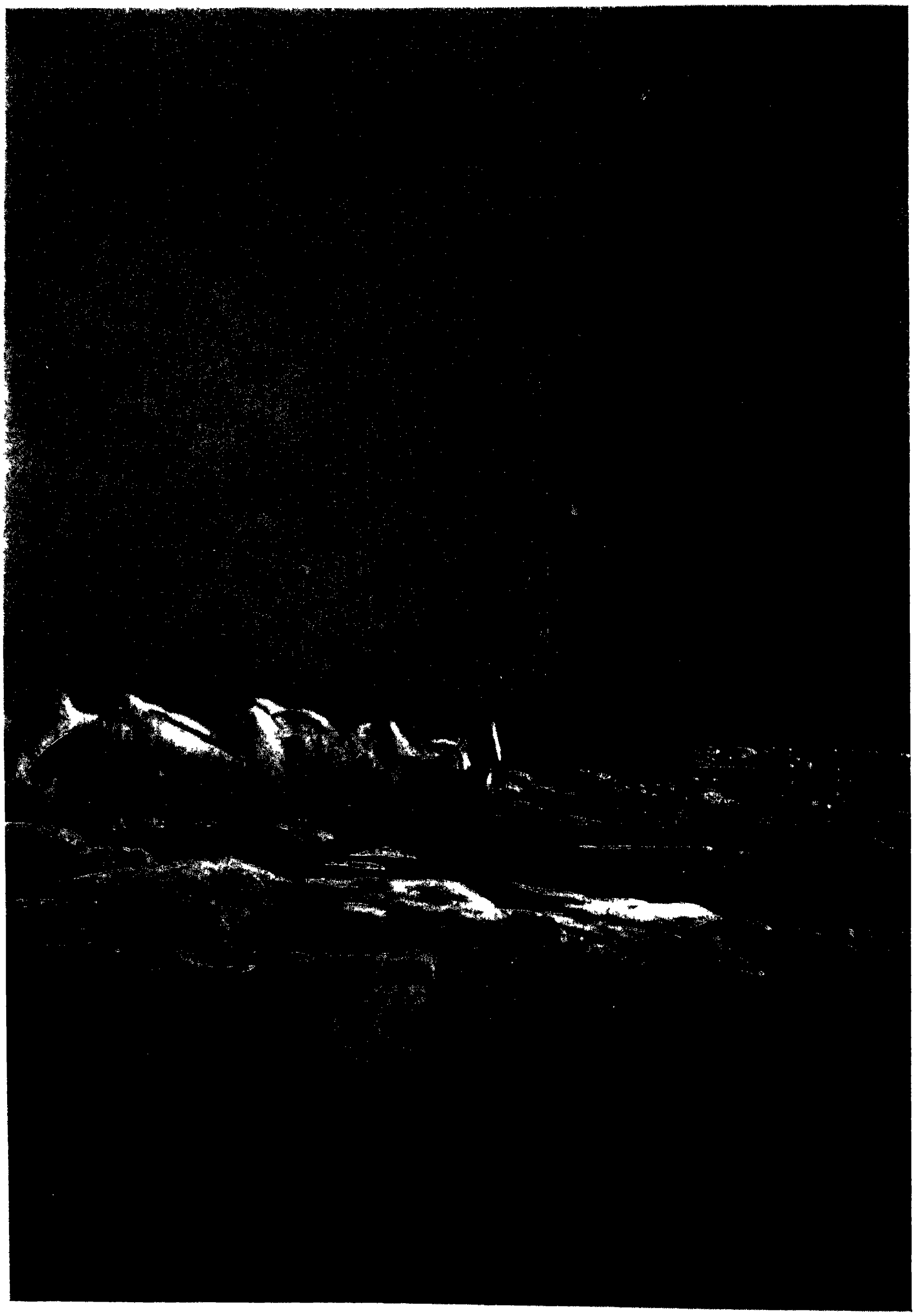
Tikei Island, 1922—On coral foreshore near northeast side of small uninhabited island, about 250 feet (76 meters) from high-water mark, and 9 feet (2 7 meters) southwest of north edge of scrub brush

ARCTIC REGION

ARCTIC SEA

Stations in this division are mainly designated by number and are described only by their latitudes and longitudes, which are given in the Table of Results They are classed among land stations, as land methods of observation were employed, though they were established on drift-ice

Descriptions of Arctic stations in Canada, Greenland, Siberia, and Alaska will be found under those headings



THE "MAUD"

MAGNETIC, ATMOSPHERIC-ELECTRIC, AND AURORAL RESULTS, MAUD EXPEDITION, 1918-1925

By H. U. Sverdrup

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INTRODUCTION

The cooperation between the Department of Terrestrial Magnetism of the Carnegie Institution of Washington and the *Maud* Expedition was initiated April 5, 1918, at a conference in the office of the Director of the Department between Captain Roald Amundsen, Dr. Fridtjof Nansen, Dr. Louis A. Bauer, J. A. Fleming, and W. J. Peters, to discuss the most suitable type of magnetic instruments for Captain Amundsen's contemplated Arctic expedition with the *Maud*. Dr. Bauer offered to place such instruments at the disposition of Captain Amundsen. The instruments decided upon were altered in the instrument-shop of the Department according to suggestions from Captain Amundsen, Dr. Nansen, and Mr. Peters, and in the spring of 1918 they were sent to Norway, together with tools and materials for repairs, stationery, forms, tables for computations, and other accessories.

The instruments were used extensively during the first part of the Expedition from 1918 to 1921, when the Northeast Passage was completed from west to east. In 1921 the *Maud* sailed from Bering Strait to Seattle for repairs and the writer had then the good fortune to take them to Washington, D. C., for comparison. During five months, while the writer was connected with the Department of Terrestrial Magnetism, the absolute magnetic observations obtained during 1918 to 1921 were reduced and discussed by C. R. Duvall of the Department and him, and a preliminary report was published.[1] In the spring of 1922 there were taken to the *Maud* the same and additional instruments, together with new supplementary equipment, all loaned by the Department. A large number of observations were secured during the drift of the vessel with the ice from 1922 to 1924 and at the winter-quarters of 1924–25. When the *Maud* returned in 1925 to Seattle, the writer had again the good fortune to take the instruments to Washington. It was then his privilege, after a brief visit to Norway, to be a Research Associate of the Carnegie Institution of Washington, assigned to the Department of Terrestrial Magnetism to prepare the results of the field work for publication.

The present report contains results and discussions of the magnetic and atmospheric-electric observations and registrations and of the auroral observations, as well as a general narrative of the Expedition. The photographs of the aurora are to be more closely examined and discussed later. The discussions have generally been confined to results of the *Maud* Expedition only, in order to make them available to others at the earliest possible time.

The ten-years' cooperation between the Department and the *Maud* Expedition greatly benefited the scientific work of the Expedition, and it is a pleasure to make record of the obligation of the Expedition to the Department of Terrestrial Magnetism. In the first place, the writer wishes to thank Director Louis A. Bauer for the generous and whole-hearted support he has rendered the Expedition during all these years and for the deep personal interest he has taken in its work. The writer has also to thank Assistant Director J. A. Fleming, who always was ready to give the Expedition the benefit of his wide experience when the instrumental equipment was to be decided upon and whose unfailing interest and critical advice was of the greatest value when preparing the present report under his supervision. Cordial thanks are due also all other members of the staff of the Department who have assisted, especially Messrs. Ault, Fisk, Duvall, Ennis, and Goldsmith, and Miss Balsam.

[1] See *Terr. Mag.*, vol. 27 (1922), pp. 35–56.

Every credit must be given to the comrades on board the *Maud*, who performed their arduous duties regardless of personal discomfort and whose enthusiastic cooperation made possible the accumulation of the data The part each one took in the successful execution of the magnetic and electric program is evident from the special reports, but here mention should be made especially of Captain Oscar Wisting, who was in command of the vessel from 1922 to 1925

Last but not least, respectful thanks are to be expressed to the chief of the *Maud* Expedition, the man who, following his plans with persistent energy, organized the Expedition and conducted it personally from 1918 to 1921, giving us in those years an inspiring example of unselfish devotion to scientific work, Captain Roald Amundsen

PART I—ABSOLUTE MAGNETIC OBSERVATIONS, 1918–1921

BY H U SVERDRUP[1] AND C R. DUVALL[2]

INSTRUMENTS

As the result of the conference at Washington, D C, in April 1918 (see p. 313), certain minor modifications were decided upon in the C I. W instruments to be supplied by the Department for the magnetic observations on Captain Amundsen's proposed "*Maud* Expedition" These modifications, none of which altered the fundamental design of the instruments, were based upon the following considerations, resulting particularly from the Arctic experiences of Dr Nansen, Captain Amundsen, and Mr. Peters

(*a*) Difficulties arising from extreme cold, such as condensation from lamps and the proximity of the uncovered face and hands as well as from the breath, the lack of delicate touch, and the necessity of wearing mitts, these difficulties, of course, apply chiefly to the work in winter

(*b*) Any one instrument should have the least possible number of parts to be assembled, thus permitting rapid unpacking and assembling, and dismounting and repacking

(*c*) All clamping screws, tangent screws, and other metal parts of the instrument which must be touched with bare fingers during adjustment, or observation, should be suitably covered with non-conducting materials, such covers should also be made of sufficient size to facilitate delicate clamping and adjustment with numbed fingers

(*d*) All glass lying between the observer's eye, and the graduation, scale, or object that he must read or observe, should be readily accessible for removal of condensation (For observations in extreme cold it is necessary to refrain, as much as possible, from breathing on the instrument)

C I W. magnetometer 8 and Dover dip circle 205 (see Plates 4 and 5) were selected as instruments most nearly answering the requirements specified by Captain Amundsen

The magnetometer is of the type fully described in Volume I of the Researches of the Department of Terrestrial Magnetism (pp 3–5). It combines the best features of the United States Coast and Geodetic Survey pattern[3] and that of the Magnetic Survey of India [4] To eliminate as far as possible questions arising because of irregularities in shape, the magnets are perfect hollow cylinders of such dimensions as to make the second distribution coefficient theoretically zero; they are inclosed in aluminum sheaths which carry the optical and centering arrangements The graduated scale for declination work is on the glass diaphragm in the magnetometer telescope The suspension used is a phosphor-bronze ribbon The torsion is readily removed by a torsion plummet with graduated rim, read by a secondary lens which may be turned into the optical system of the magnetometer telescope The deflection bar is of brass, in one piece and practically rectangular in cross-section. The long magnet has an internal diameter of 0.75 cm, an external diameter of 1.00 cm, and a length of 7.50 cm. The horizontal circle is 12 5 cm. in diameter. The short magnet has an internal diameter of 0.61 cm, an external diameter of 0 82 cm, and a length of 3 50 cm.

The C I W. Dover dip circle 205 is the regular land pattern as formerly made by A. W Dover, of New Charlton, Kent, England

The above instruments were modified and altered by providing celluloid covers for all parts subject to handling in use and adjustment in the field The hood connection between the magnetometer telescope and house was altered so as to eliminate the necessity of fitting the hood to the telescope when assembling the instrument. This was

[1] In charge of scientific work on the Expedition and Research Associate of the Carnegie Institution of Washington

[2] Expert computer of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington

[3] HAZARD, D L Directions for magnetic measurements United States Coast and Geodetic Survey, Washington, D C, pp 53–55, 1911

[4] FRASER, H A D The unifilar magnetometer of the Magnetic Survey of India *Terr Mag*, vol 6, pp 65–69, 1901 See also Hazard, D L, *l c*, pp 59–60

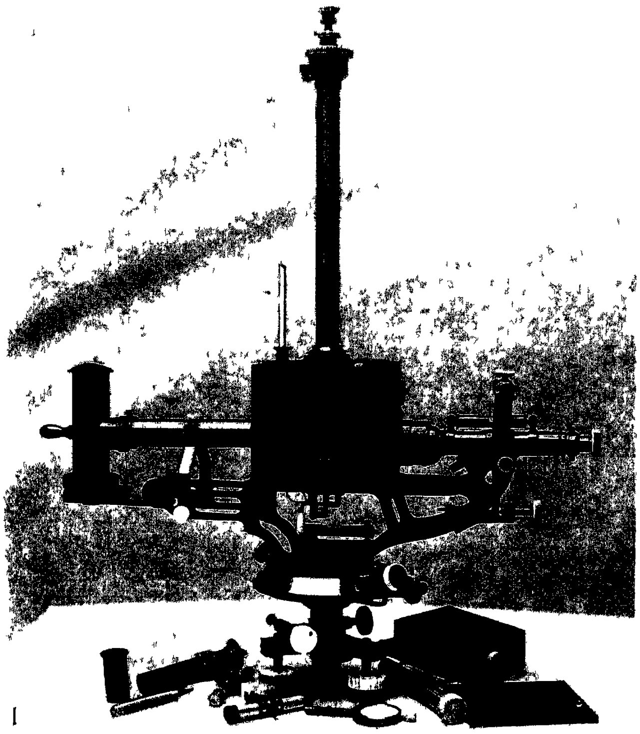
accomplished by the addition of a spherical-ended cap on the objective end of the telescope, arranged to make contact with a velvet-lined concave mounting attached to the magnetometer-house (this arrangement is similar to that used on the later types of C I W magnetometers). Celluloid grips were also mounted on the reversing bar-magnets of the dip circle The arresting device for the compass-attachment of the dip circle was altered by an eccentric mechanism to facilitate clamping and unclamping of the needle. Accessories with the dip circle included compass-attachment, two pairs of dip needles (Nos 1, 2, 5, and 6), two pairs of intensity needles (Nos 3 and 4, 7 and 8), besides one pair of dip needles (Nos 9x and 10x) to serve for practice observations as well as for possible emergency use A special lifting device was made by which the dip needles could be lifted off the agate supports and turned face about without opening the magnet-house, however, as its operation seemed to involve some danger of accident to the needles, this attachment was removed from the instrument before it was sent away A more detailed idea of the modifications may be obtained by an inspection of Plates 4 and 5, which show various views of the magnetometer and dip circle

The accessory equipment supplied by the Department of Terrestrial Magnetism for the magnetic work included three tripods—one for magnetometer 8, one for dip circle 205, and the third for use in connection with astronomical observations; three magnetic observing-tents, containing no iron fastenings of any kind; three good watches, miscellaneous tools, materials, etc , various small accessories; forms for recording magnetic observations of various kinds, together with some forms for astronomical observations and some miscellaneous forms, miscellaneous books relating to terrestrial magnetism, earth-currents, atmospheric electricity, etc ; complete instructions for observations with the different instruments and general instructions for the magnetic work, with special attention paid to the difficulties the Expedition would meet on account of large magnetic disturbances and severe weather conditions.

In May 1919, a new device was added to magnetometer 8. Experience had shown that with numbed fingers it was extremely difficult to take out or hang in the magnet of the magnetometer without breaking the suspension fiber Mechanic Sundbeck, of the Expedition, therefore, constructed a clamping and lifting fork, which could be handled from the outside of the magnet-house. This fork can be closed around the suspension hook for the magnet, which then may be lifted so that the suspension-fiber is slackened and the magnet can be removed from or suspended in the stirrup without any risk of breaking the fiber Sundbeck's device had only the drawback that a hole, which had to be filled with cotton, was made in the magnet-house This deficiency was corrected, and some small improvements were added to Sundbeck's device, at the Department of Terrestrial Magnetism, Washington, D C, in February 1922 (Figs 3 and 4 of Plate 4 show this clamping device and its mounting in the magnet-house).

In addition to the instruments from the Department of Terrestrial Magnetism, the Expedition had also Dover land dip circle 154, with one pair of dip needles (Nos 1 and 2), and a photographic registering declinometer made by Max Toepfer and Son, Potsdam. Registering magnetic instruments were generally not included in the equipment of the Expedition, because in the drifting ice it would not be possible to use them on account of the perpetual movement of the ice, but this declinometer, which was the property of the Expedition, was taken along in the expectation that it might be used at occasional shore stations, e g, at winter-quarters

For astronomical work the Expedition had three sextants, five theodolites of different sizes, three chronometers, and fifteen watches (inclusive of three supplied by the Department of Terrestrial Magnetism).



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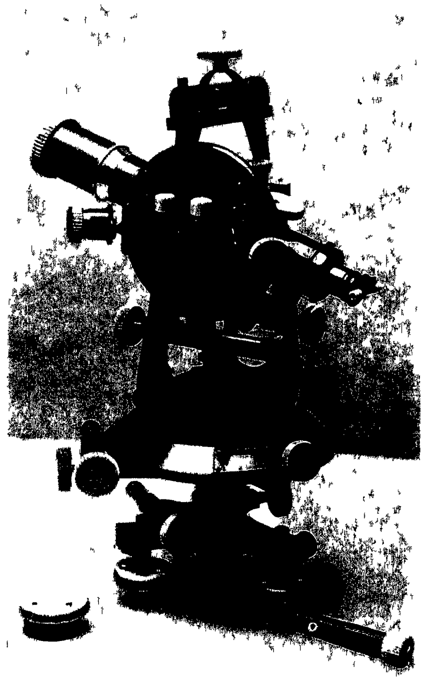

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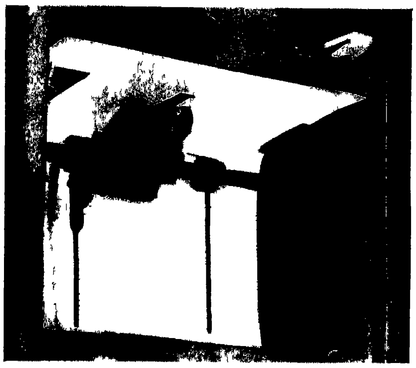
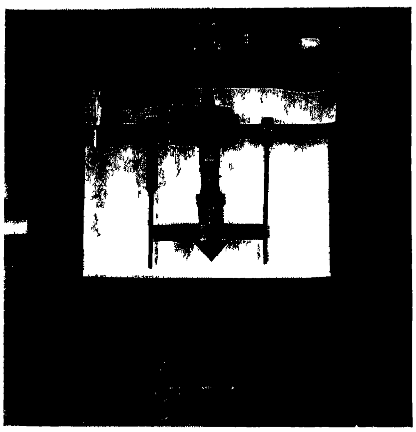
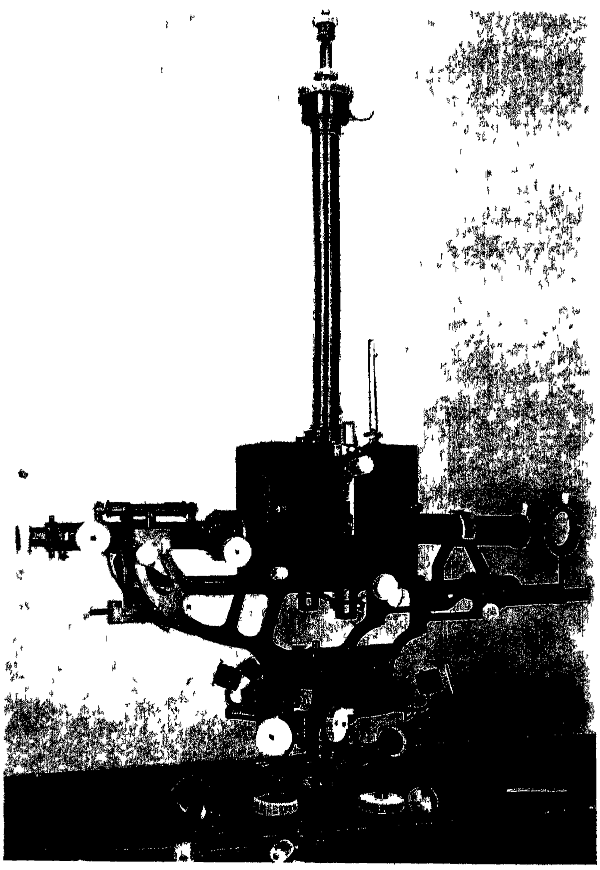






THEODOLITE MAGNETOMETER 8

1 Assembled magnetometer and appurtenances
3 and 4 Special clamping-device, open and closed
2 Theodolite of magnetometer
5 View to show outside operating-screw and clamp-lever of clamping-device

METHODS OF OBSERVING

The magnetic observations were made in accordance with instructions from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. The methods used are given in detail in Volumes I, II, and IV of the *Researches* of the Department (see particularly pp. 13–41 and specimen observations, Vol I) The experiences of the Expedition's observers in making magnetic observations in the Arctic do not differ essentially from those of observers on former expeditions, but it may be useful to review them briefly. For convenience, the observations at the temporary observatories at winter-quarters, and those made at field stations or on sledge-trips, are discussed separately

OBSERVATORY WORK

At the end of September 1918 a magnetic observatory was built on shore (station No 4) It was built of drift-wood logs and planks, with wooden or copper nails, and was, therefore, perfectly non-magnetic. To keep the temperature as high as possible, the inside was lined with canvas, and snow was thrown over the house Due to the insulating capacity of the snow, the temperature in the observatory only occasionally sank below −25° C , while outdoors it might be as cold as about −40° C , for weeks at a time

The dimensions of the observatory were 3 by 4 meters, and the height to the ridge-pole 2 8 meters In the room two wooden piers were placed at a distance apart of 1 8 meters They were driven as far down in the ground as the frost permitted, and had no connection with the floor. The magnetometer was placed on the front pier and the dip circle on the back pier. During observations, all magnets not in use were placed on a snow-pillar 10 meters in front of the house Both instruments were permanently installed by the end of November. The magnetometer was kept mounted on the same pier until August 11, 1919, but the dip circle was used for field work after April 1, 1919. From the beginning of March, observations were made occasionally at two auxiliary stations close to the observatory.

During the winter, the observatory was lighted by a gaslight lamp of the "Lux" pattern, which also develops considerable heat All iron parts of the lamp had been replaced with parts of copper or brass The vernier readings were made by means of small electric lamps, the current being supplied by a dry-cell battery which had to be taken on board after each observation in order not to get too cold The same battery was also used for illuminating the mark for declination observations, which was used in the dark season. This mark was simply a small electric lamp which was fastened on top of a staff in front of the observatory and could be lighted from the inside of the observatory During the period of daylight, a pole placed in a cairn at about 600 meters distance was used as a mark.

The observatory-house was torn down April 1, 1919, and a square tent 2 by 2 meters, made of light canvas, was placed on the wooden floor; thus no artificial illumination was needed. At this season the tent had the advantage of being much warmer than the house. Even on a wholly overcast day the temperature inside the tent might be 10° C higher than outside, while on a clear day with sunshine the temperature might be 25° C. higher.

The greatest difficulty experienced on account of the low temperature during the winter was in the manipulation of the magnetometer when the lightest phosphor-bronze fiber (designated "Grade 0") was used for suspension. It seemed that the fiber was affected by the low temperature in such a way that it broke more easily, because several times it was broken at the beginning of the observations before the fingers were cold and numbed. The "grade-0" fiber, therefore, had to be replaced with a heavier grade In May 1919, Mechanic Sundbeck, of the Expedition, constructed the clamping and lifting

fork mentioned on page 316, after which it was possible to use the finest fiber at any temperature

The formation of frost on the instrument was often troublesome At a reasonable temperature the frost formation could be avoided by not breathing against any part of the instrument, but at low temperatures the frost formed as soon as the face came close to the instrument, so that the observer had to constantly scrape the frost away from verniers, etc This, of course, made the observations longer and added to the disagreeableness of working with bare fingers at temperatures of $-25°$ to $-30°$ C The magnetic instruments supplied had, however, one advantage over the other instruments in that all screwheads, etc , of metal had been replaced with celluloid ones During observations in intense cold the fingers get so close to the point of freezing that the least touch of metal feels like touching a flame, and leaves a white, frozen spot on the finger To touch the non-conducting celluloid is much less disagreeable, and can usually be done without freezing the finger

Some trouble was anticipated in the behavior of the watches at low temperatures It was found that some of the watches, perhaps on account of the quality of the oil used in them, behaved very satisfactorily, despite the great changes in temperature

That magnetic disturbances often caused difficulties need hardly be mentioned Sometimes the disturbances were so violent that the observations had to be broken off because the magnet disappeared from the field of view time after time

Included in the instructions from the Department of Terrestrial Magnetism was a memorandum in which attention had been called to the possibility that under certain circumstances it might be desirable to abbreviate the observations, and special instructions for abbreviated observations had been worked out However, it was never found necessary to curtail any set, because with moderate magnetic disturbances it was just as easy to get a full set as a half one, and besides, the ordinary observations never took such a long time that the low temperature became unbearable The results thus confirm previous experience, namely, that magnetic observations can be carried out without serious difficulty under Arctic conditions in an observatory of primitive construction

During the winter of 1918 to 1919, the photographic declinometer was mounted in a long, low building attached to the observatory, from which it could be entered The whole building was buried in snow, so the temperature did not sink below $-20°$ C. in the registering room In spite of this, it was not possible at first to make the clock which drives the drum work properly, but this difficulty was overcome by removing all oil by a benzine bath and then applying a small quantity of kerosene as lubricant The registrations were kept up from November 10, 1918, to July 31, 1919, with only occasional interruptions.

FIELD WORK

The general experience on this Expedition was that magnetic field work in the Arctic can only be carried out successfully in spring and summer In the fall and in the winter much bad weather and short daylight make it almost impossible to take magnetic observations in the field, even though it is feasible to travel in these seasons

The kinds of instruments which may be used in the field depend upon the means of transportation If the observer travels with reindeer, an ordinary field equipment, including an observing-tent, may be taken along, so the conditions in the favorable seasons will be the same as for ordinary field work But for travel with dog sledges the conditions are different, and ordinarily the weight of equipment carried has to be reduced as much as possible The most suitable instrument for carrying on a dog sledge is the dip circle with compass-attachment, but without tripod On the sledge-journeys undertaken by this Expedition the dip circle, instead of being placed on a tripod, was mounted

on top of the instrument-box, which has been provided with three brass grooves for the foot-screws All magnets and accessories were taken out of the instrument-box of the dip circle before placing the instrument upon it The steel pins in the hinges were the only magnetic material in the box Thorough examination and test at the Department of Terrestrial Magnetism in December 1921 showed that the steel pins for the cases of both dip circles 205 and 154 were slightly magnetic, but that the effect upon dip needles and compass was entirely negligible The steel pins were replaced by non-magnetic pins in December 1921, before assignment of the instruments for future work of the Expedition

On calm days a pier of snow-blocks was built and the instrument placed on top of this, thus making it possible for the observer to stand in a half-upright position But on windy days the instrument-box had to be pressed down into the snow behind a low protecting snow-wall, and the observer had to lie down to make the observations In the winter of 1920 to 1921, the field observations were generally made in a small three-cornered tent, which was also used by the observers personally The instrument-box, with the instrument on top, was placed directly on the snow, and this, in connection with the small size of the tent, caused some inconvenience It was always found that the arrangement with the instrument on top of the box, placed directly on hard snow or on a snow-pier, was absolutely stable

In the spring of 1919 a special program was decided upon to insure obtaining approximately simultaneous observations at field stations and at the winter-quarters station This scheme was carried out for the work in 1919 but could not be kept up the two following years, in 1920 all instruments were used for field work, and in 1921 there was a lack of observers

It will be noted that no declinations were determined at most of the field stations This was because Messrs Wisting and Hanssen were unfamiliar with the use of the theodolite for determination of azimuth During January 1922, the peep-sights of the compass-attachment of dip circle 205 were modified in the instrument-shop of the Department of Terrestrial Magnetism in such a way that it will be possible to sight the Sun directly, or to use a shadow-method for determination of azimuth in future work. If, in addition, a sextant observation for local time is made, the true azimuth of the Sun may be computed, and thus all necessary data for determination of the declination will be available.

REDUCTIONS TO STANDARD INSTRUMENTS

MAGNETIC STANDARDS ADOPTED

The International Magnetic Standards (designated I M S) as defined in Volume II of the "Researches of the Department of Terrestrial Magnetism," pages 211 to 278 (see also Volume IV, pp 395–475) have been adopted for the results contained in this report

The instruments used as standards by the Department and with which the instruments of the Expedition were compared are as follows In declination, C I W. magnetometer 3 with correction on I M S of −0′1 to observed values, in horizontal intensity, C I W magnetometer 3 with zero correction on I. M S to observed values, in inclination, earth inductor 48, made by Schulze, with zero correction on I M S to observed values Magnetometer 8 and dip circle 205 were compared with these instruments in Washington by the method of simultaneous observations, with exchange of stations, in April 1918 and in November and December 1921 Dip circle 154 was not available for the comparison in Washington in 1918, and its corrections depend upon field comparisons with dip circle 205 and upon comparison observations made in Washington in November 1921

INSTRUMENTAL CONSTANTS, CORRECTIONS, AND COMPARISONS

The instrumental constants for C I W magnetometer 8 supplied the Expedition and used throughout the computations are shown in the following summary

Constants of C. I. W. Magnetometer 8

Scale value 1 division = 1′48

Deflection-distances and horizontal-intensity constants, magnets 8L and 8S, at 20° C

r=22 511 cm, log C=6 25574	r=30 012 cm, log C=5 87612
r=25 012 cm, " C=6 11642	r=35 006 cm, " C=5 67378
r=27 510 cm, " C=5 99076	r=40 006 cm, " C=5 49867

At $t°$, log C=log C_{20}+(20°−t)0 0000235

Table of (20°−t) 0 0000235 in units of 5th decimal for values of (20°−t)

(20°−t)	0	1	2	3	4	5	6	7	8	9	Remarks
00	0	2	5	7	9	12	14	16	19	21	The coefficient of linear expansion for the deflection bar for 1° centigrade is assumed to be 0 0000189
10	24	26	28	31	33	35	38	40	42	45	
20	47	49	52	54	56	59	61	63	66	68	
30	70	73	75	78	80	82	85	87	89	92	

Temperature coefficient for magnet 8L q=0 000299

Induction coefficient for magnet 8L $\mu=mh$=2 99, for m=475 (h=0 0063)

Distribution coefficients magnets 8L and 8S P=+15 29, Q=−461

Table of moments of inertia, K_1 for inertia-bar 8, and K for magnet 8L and its suspension

Temp C	Log K_1	Log K	Log π^2K	Remarks
0°	2 37055	2 37496	3 36926	The value of log K depends on determinations made with inertia-bars C I W 8 and 10, April 28, 29, 1918, the weight of magnet 8L and stirrup determined April 27, 1918, was 51 195 grams
10	070	506	36	
20	086	516	46	
30	101	526	56	
40	117	536	66	

Table of temperature and induction corrections for magnet 8L

Values of log (1±$q\Delta t$) q=0 000299 for magnet 8L			Values of log $\left(1+\mu \frac{H}{m}\right)$ $\mu=mh$=2 99 for magnet 8L	
($t-t_s$) ($t'-t$) Cent	log [1−$q(t'-t)$] " [1+$q(t-t_s)$] $t'-t$=− $t-t_s$=+	$t'-t$=+ $t-t_s$=−	log $\frac{H}{m}$	log $\left(1+\mu \frac{H}{m}\right)$
1°	+0 00013	−0 00013	5 80	0 00008
2	026	026	5 90	010
3	039	039	6 00	013
4	052	052	6 10	016
5	065	065	6 20	021
6	078	078	6 30	026
7	091	091	6 40	033
8	104	104	6 50	041
9	117	117	6 60	052
10	130	130	6 70	065
11	143	143	6 80	0 00082
12	156	156		
13	168	169		
14	181	182		
15	194	195		
16	207	208		
17	220	221		
18	233	234		
19	246	247		
20	+0 00259	−0 00260		

Memoranda regarding use of magnetometer in high magnetic latitudes—As the value of horizontal intensity, H, decreases, deflection angles at the various distances will increase It will be possible to use the distances 30, 35, and 40 cm throughout the Expedition, except where very small values of H prevail, when it will probably be necessary to use only 35 and 40 cm , because of the very large and therefore unstable deflection angle at the distance 30 cm As the value of H decreases, the period of oscillation for the magnet 8L will increase with probably an increasing uncertainty of accuracy in the determination of the time of one oscillation

Memoranda regarding formulæ for intensity computation from magnetometer observations—The above constants are based on following reduction formulæ

$$mH=\frac{\pi^2 K}{T^2} \qquad \frac{H}{m}=\frac{C}{\sin u}$$

T is the time of one oscillation corrected for rate of chronometer, torsion, temperature effect, amplitude, and induction, K is the moment of inertia and m the magnetic moment of the oscillating magnet and suspension, u is the mean deflection angle,and C the constant, corrected for change in length of brass deflection-bar with temperature, which involves the deflection distance r, induction coefficient μ, and distribution coefficients P and Q, thus

$$C=\frac{2\left(1+\frac{P}{r^2}+\frac{Q}{r^4}\right)}{r^3\left(1+\frac{2\mu}{r^3}\right)}$$

Corrections on I M S for C I W magnetometer 8—The results of standardizations at Washington of C I W magnetometer 8 before and after the work reported upon are in excellent agreement The observed corrections on I M S with particulars as to the comparisons and the adopted mean corrections which have been applied to obtain the data given in the Table of Results are shown in Table 1

TABLE 1—*Corrections on I. M S for C I W Magnetometer 8*

Date	Stations	Compared with	No Sets D	No Sets H	(I M S − C I W No 8) D	Probable error	$\frac{\Delta H}{H}$	Probable error	Observers
Apr 24,25, 26,27, 1918	S_m and N_m, Washington	M3	12	6	−0′7	±0′1	−0 00033	±0 00003	H W Fisk D M Wise
Nov 29,30, Dec 8,9,10, 1921	S_m and E_m, Washington	M3	17	6	−0 7	±0 1	−0 00029	±0 00008	H W Fisk H R Grummann H U Sverdrup
Mean values	(I M S − C I W No 8) [a]				−0 7		−0 00031		

[a] The corrections are to be applied reckoning east declination and horizontal intensity as positive and west declination as negative

The above corrections for observed declinations are those applying for complete determinations, using magnet 8L The declination may be obtained also from the deflection observations made in the determination of horizontal intensity, provided mark-readings are made before and after such observations. Throughout the 1918–1921 work, declinations were determined from observations with magnet 8L, but for purposes of record the correction on I M. S. of observed declinations with magnet 8S deflected by magnet 8L may be noted as follows

For declinations determined from deflection-observations in connection with mark-readings, the collimating tube of the magnet 8S being kept at all times erect in its stirrup, the corrections are

For magnet 8L erect in its stirrup in deflection-box and magnet 8S erect in its stirrup suspended, for mean value from deflection east and west of suspended magnet, for all distances +1° 32′

however, it seemed wiser to adopt the field determination, since the six sets give quite consistent results

As stated above, the observers of the Expedition found it convenient to observe loaded dip and deflections at all stations, thus eliminating any uncertainty that would otherwise be involved in the determination of the loaded dip or of the deflection-constant to be used at the epoch of observation In this connection it is interesting to note the following changes in the logarithms of the loaded dip and of the deflection-constants as determined at Washington, the differences being given as corrections of the 1921 on the 1918 values: Loaded dip, +0 01022 and +0 02698 for needle-pairs 3 and 4 and 7 and 8 respectively, deflections, −0 01310 and −0 02415 for needle-pairs 3 and 4 and 7 and 8 respectively

TABLE 4—*Intensity-Constants Based on I M S for C I W Dover Dip Circle 205*

Date	Station	Compared with	No sets	Logarithm of combined constant C for total-intensity needles			Observers
				3 and 4	7 and 8	7 and 8 of 178	
Apr 28,29,30, 1918	S_m and N_m, Washington	M 3 EI 48	6	9 57770	9 57594		J P Ault H W Fisk A Thomson
May 30, July 11,12, 22,25,29, 1919	Nos 4 and 4*c* [a]	M 8 DC 205	6	(9 57655)			A and W [b]
Mar 24,27, Apr 24, 28, July 12,29, Aug 6, 1919	Nos 4 and 4*b* or 4*c* [a]	M 8 DC 205	7		(9 57652)		A,H,S, and W [b]
Apr 26, 1921	Nos 41*c* and 41*d* [a]	M 8 DC 205	1	(9 57767)			S and W [b]
Dec 1, 2, 6, 1920, Jan 12,19,25,1921	Nos 41 and 41*b*	DC 205 34	6			9 62085	H U Sverdrup
Nov 26,28, Dec 1, 2, 7, 1921	S_s and E_m, Washington	M 3 EI 48	6	9 57626	9 57735	9 62140	H W Fisk H U Sverdrup
Adopted value log C				9 57698	9 57664	9 62085	

[a] Assuming station-difference negligible and interpolating adopted value for intensity to time of observation with dip circle

[b] See page 327 for names of observers

MEMORANDA REGARDING FORMULAS FOR INTENSITY-COMPUTATIONS

If I=inclination, I'=loaded inclination, u_1=deflection angle, $u=I-I'$, F=total intensity, H=horizontal intensity, m=magnetic moment of loaded needle, C_{l_t}=loaded-dip constant at $t°$ C, C_{d_t}=deflected-dip constant at $t°$ C, C=combined constant independent of temperature, t_s=standard temperature adopted (20° C), and K and K_1=constants involving weight used in loaded needle, distance between needles during deflection-observations, distribution, and induction coefficients, then

$$C_{l_t}=\frac{K}{m_t}=F \sin u \sec I'=H \sec I \sin u \sec I'$$

$$C_{d_t}=K_{1m_t}=F \sin u_1=H \sec I \sin u_1$$

$$C=\sqrt{KK_1}=F\sqrt{\sin u \sin u_1 \sec I'}=H \sec I\sqrt{\sin u \sin u_1 \sec I'}$$

or conversely

$$F=C_{l_t} \csc u \cos I'=C_{d_t} \csc u_1=C\sqrt{\csc u \csc u_1 \cos I'}$$

$$\log C_{l_t}=\log C_{l_{t_s}}-(t°_s-t°)q$$

$$\log C_{d_t}=\log C_{d_{t_s}}+(t°_s-t°)q$$

where q is the effect for a 1-degree change in temperature on $\log C_l$ or on $\log C_d$ The usual value of q for intensity-needles similar to those of dip circle 205, viz, 0 00010 for 1° centigrade, was used.

(It is much preferable and requires but little extra time to observe both loaded dip and deflections, as log C is very nearly constant and requires no temperature correction Log C is, furthermore, free from effect due to change with time in the magnetic moment of the deflecting needle.)

Every precaution should be taken to avoid unnecessary alterations in the magnetization of the intensity-needles. The needles should be invariably replaced in their boxes in position as indicated by the letters in the boxes and with faces toward letters, they should never be allowed to touch each other and should never be placed near enough to the bar magnets to be affected by them

The original computations of dip-circle intensity-observations were made, using the dip-needle corrections and intensity-constants as originally determined at Washington To avoid the labor of recomputation, differential formulæ for corrections on computed values of intensity on account of changes arising from the finally adopted values of the respective corrections and constants were deduced These are shown in Table 5

TABLE 5—*Corrections on Computed Values of Total Intensity, F, and Horizontal Intensity, H, for Changes in Log Constant and in Inclination, I*

Number	Element	Corrections on computed values					
		Combined loaded dip and deflections		Loaded dip only		Deflections only	
		For change in C	For change in I	For change in C_l	For change in I	For change in C_d	For change in I
(1)	ΔF	$\frac{1}{M} F \Delta(\log C)$	$-\frac{1}{2} \cot u\, F\, \Delta I$	$\frac{1}{M} F\, \Delta(\log C_l)$	$-\cot u\, F\, \Delta I$	$\frac{1}{M} F\, \Delta(\log C_d)$	0
(2)	ΔH	$\frac{1}{M} H\, \Delta(\log C)$	$-[\tan I + \frac{1}{2} \cot u]\, H\, \Delta I$	$\frac{1}{M} H\, \Delta(\log C_l)$	$-\frac{1}{\cos^2 I\, C_l} H^2\, \Delta I$	$\frac{1}{M} H\, \Delta(\log C_d)$	$-\tan I\, H\, \Delta I$
(3)	ΔF	$2\ 30\, F\, \Delta(\log C)$ $[0\ 362]\, F\, \Delta(\log C)$	$-14\ 5 \cot u\, F\, \Delta I$ $-[1\ 163] \cot u\, F\, \Delta I$	$2\ 30\, F\, \Delta(\log C_l)$ $[0\ 362]\, F\, \Delta(\log C_l)$	$-29\ 1 \cot u\, F\, \Delta I$ $-[1\ 464] \cot u\, F\, \Delta I$	$2\ 30\, F\, \Delta(\log C_d)$ $[0\ 362]\, F\, \Delta(\log C_d)$	0 0
(4)	ΔH	$2\ 30\, H\, \Delta(\log C)$ $[0\ 362]\, H\, \Delta(\log C)$	$-29\ 1\, [\tan I + \frac{1}{2} \cot u]\, H\, \Delta I$ $-[1\ 464]\, [\tan I + \frac{1}{2} \cot u]\, H\, \Delta I$	$2\ 30\, H\, \Delta(\log C_l)$ $[0\ 362]\, H\, \Delta(\log C_l)$	$-29\ 1 \frac{1}{\cos^2 I\, C_l} H^2\, \Delta I$ $-[1\ 464] \frac{1}{\cos^2 I\, C_l} H^2\, \Delta I$	$2\ 30\, H\, \Delta(\log C_d)$ $[0\ 362]\, H\, \Delta(\log C_d)$	$-29\ 1 \tan I\, H\, \Delta I$ $-[1\ 464] \tan I\, H\, \Delta I$

In the general formulæ (1) and (2) M is the modulus of common logarithms, F, H, ΔF, and ΔH are in same unit, either gammas or C G. S , $\Delta(\log C)$, $\Delta(\log C_l)$ and $\Delta(\log C_d)$ are in same unit as their respective constants, and ΔI is in radians

In formulæ (3) and (4), arranged for numerical work, F and H are in C G S units, ΔF and ΔH are in gammas, $\Delta(\log C)$, $\Delta(\log C_l)$, and $\Delta(\log C_d)$ are in units of the fifth decimal of the logarithms, and ΔI is in minutes In the second line for both (3) and (4) the first line is repeated, except that the logarithm of the constant factor is written in brackets Each difference expressed by a Δ in these formulæ, such as ΔH, ΔI, $\Delta(\log C)$, etc , is defined as corrected value minus original value

TESTS OF DIP NEEDLES FOR PIVOT-DEFECTS

The correction determined for needle 5 of dip circle 205 by comparisons at Washing ton in 1918 was $-0'.1$, while that determined by comparisons after return of the instrument in 1921 was $-5'.9$, the corrections for the other three needles, however, showed no material changes Apparently this large difference in the correction for needle No. 5 was caused by some change which took place in the interval. From a careful inspection of the readings made in the several positions of circle and needle, using the means of six sets, and comparing with the mean dip as determined by the earth inductor simultaneously, it was discovered that there had been no material change in the behavior of the needle with end B north, but with end A north, in the position circle face west and needle face east, the correction had changed by an amount approximating 1°.

Special tests were then carried out by Messrs. Fisk and Sverdrup, first by means of observations in different ex-meridian planes, and later by using two large Helmholtz coils mounted on a pier in the standardizing observatory of the Department in such a way that the Earth's horizontal field could be modified as desired (see Fig 4 of Plate 5) The results of these tests indicate that the large correction to needle 5 at the inclination of the Washington station was due to a pivot-defect of the sort described by H. W. Fisk

in his paper entitled "Dip-Needle Errors arising from Minute Pivot-Defects".[5] As already stated, it appears that this defect developed since the earlier comparisons, but inasmuch as the tests made by means of the Helmholtz coils show that its extent is limited to values of inclination less than those obtained at the field stations, and since the needle in all other positions behaves normally, no account is taken of the comparisons of 1921 in adopting the correction for needle 5 (see Table 2)

Tests similar to those applied to needle 5 were then made by Messrs Fisk and Sverdrup of all needles assigned to dip circles 205 and 154, using the Helmholtz coils to vary the inclination throughout the range expected on the forthcoming voyage of the Expedition, that is, from about +74° to +88° These tests show that, at the time of the comparisons, there were no pivot-defects which would sensibly affect the determinations of inclination to be made by the Expedition

MAGNETIC OBSERVATIONS, 1918–1921

EXPLANATORY REMARKS

Precisely the same conventions have been followed in the presentation of the field results obtained during the four years 1918 to 1921 as adopted in Volumes I, II, and IV of the *Researches* of the Department of Terrestrial Magnetism These conventions, briefly recapitulated, are as given in the following paragraphs

It has not been deemed advisable to attempt at present to apply corrections to the observed results on account of the numerous variations of the Earth's magnetism, *e g*, diurnal variation, secular variation, magnetic perturbations, etc Instead, it is believed to be better to publish the observed results as obtained, with no corrections applied except the reductions to the magnetic standards of the Department (see p 319) The reduction to a common epoch can be undertaken more advantageously later It will be noticed, however, that opposite the magnetic elements appearing in the Table of Results (pp. 332–336), the precise date and local mean time of each observation are given, thus supplying the required information for reducing the observed values to some mean period. The tabular entries are in the order of decreasing north latitude.

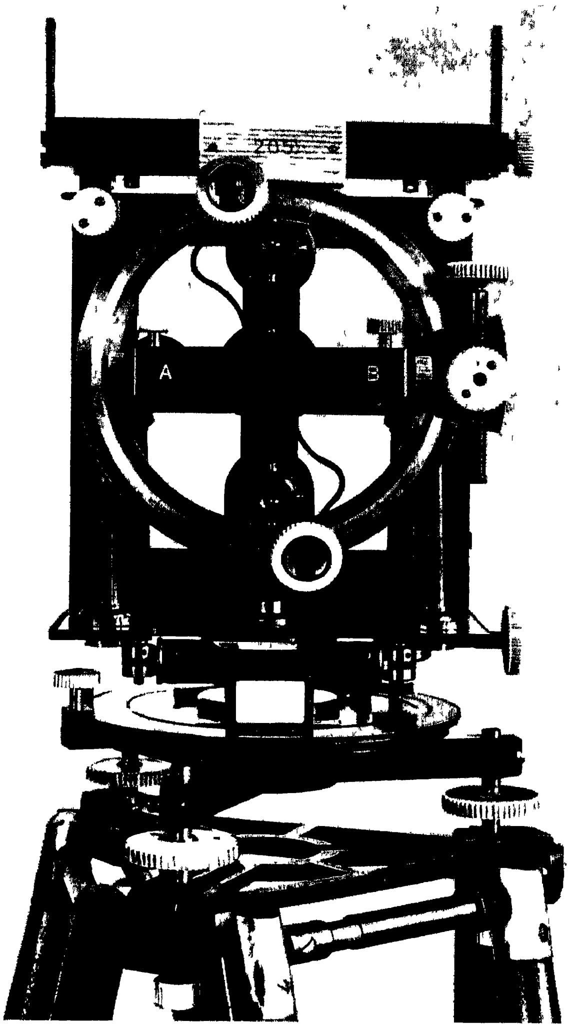
The question whether to give values of horizontal intensity exclusively or values of total intensity was decided in favor of the former The horizontal-intensity values indicated in italics are derived from the observed total-intensity values and the observed inclinations

The intensities are published in C G S units The fourth decimal may be frequently uncertain by one or more units It will be noted that the values are given to the fifth decimal, but it should be understood that no claim is made as to the correctness of the last figure, this figure is retained primarily in order that when all reductions to epoch have been applied on account of the magnetic variations, an error of a unit in the fourth decimal, due purely to computation, will not enter

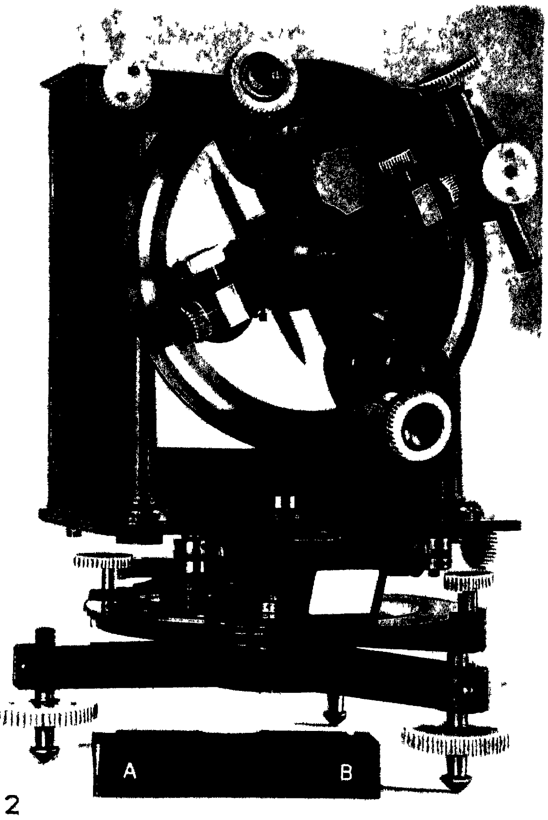
The headings for the columns of the Table of Results are self-explanatory The following abbreviations have been adopted for the months of the year. Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec. For stations near the meridian 180° east of Greenwich the dates are reckoned from that meridian without regard to the international date line Local mean times are expressed to the nearest 0.1 of an hour of each value and are given according to civil reckoning, being counted from midnight as zero hour continuously through 24 hours; 16^h, for example, means 4 o'clock p. m. The declination and inclination values are, in general, given in degrees, minutes, and tenths of minute of arc The values of declination resulting from compass-observations are given to the nearest minute only, as the results can not be considered of greater precision

[5] *Res Dep Terr. Mag*, vol. IV, pp 359–372.

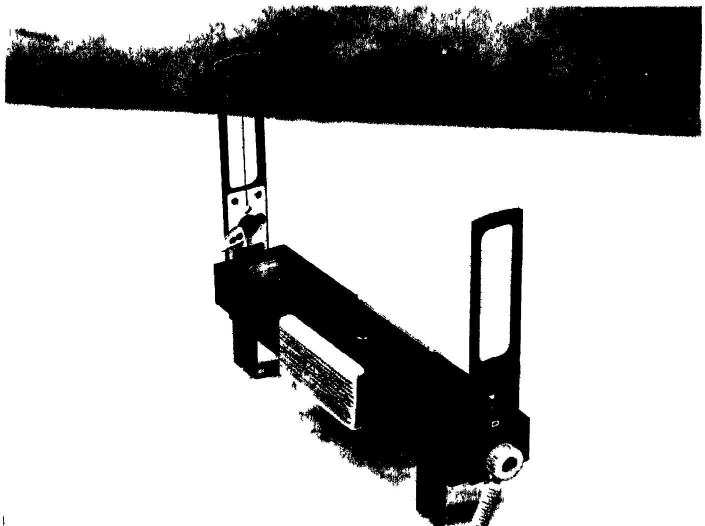
PLATE 5



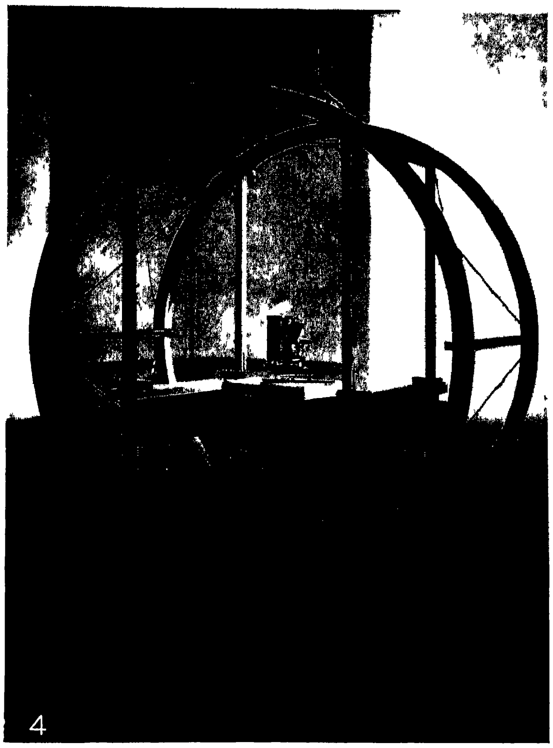
1



2



3



4

DIP CIRCLE 205 AND PIVOT-TEST APPARATUS

1 Compass-attachment mounted
2 Intensity needles mounted for deflections
3 Modified compass-attachment for use after 1922
4 Apparatus for tests to determine pivot-defects

n the nearest minute The instruments are designated in the instrument columns ollows Under "Mag'r," 8 for magnetometer 8, and *205* for dip circle 205, when 205 ; used for either declination or horizontal intensity, under "Dip Circle," 205 with nbers following to indicate the numbers of needles used for dip circle 205 [needle 7 ircle 178 is indicated by being inclosed in parentheses, thus, 205 56(7)], and 154 h numbers of needles following for dip circle 154

OBSERVERS

In the last column of the Table of Results, the observer responsible for the obser-ions is shown by his initials When the observations were made jointly by two ervers, the fact is shown by combination of their last initials Table 6 shows the ervers and their designations

TABLE 6—*Magnetic Observers, 1918–1921*

Observer	Designation	Observer	Designation
R Amundsen	RA	Amundsen and Sverdrup	A&S
H Hanssen	HH	Sverdrup and Hanssen	S&H
P Knudsen	PK	Sverdrup and Wisting	S&W
H U Sverdrup	HUS	Wisting and Hanssen	W&H
O Wisting	OW		

A large part of the original computations was carried out in the field by H U Sver-p The final computations and revisions were made by H U Sverdrup and C R vall, with some assistance from H W Fisk of the Department of Terrestrial Magnet-
Subsequent to the final revision of the results, the data from independent com-ations of the astronomical observations of 1920 as carried out at the Astronomical ervatory of the University of Christiania under the direction of Professor J Fr roeter were received, these results agreed with the astronomical computations already le, thus serving as an additional check.

DISTRIBUTION AND GEOGRAPHIC POSITIONS OF STATIONS

Figure 3 shows the route of the *Maud* from Norway to Bering Strait Figures , and 6 show the positions of the stations on the Chelyuskin and Chukotsk peninsulas ee of the stations, Nos 4, 21, and 41, are close to the winter-quarters of the *Maud* ng the winters 1918–19, 1919–20 and 1920–21, respectively For these stations, the ude has been determined within an accuracy of 0′1 The values of the longitudes probably accurate within 2′ of longitude more or less They have been determined neans of chronometers whose corrections on Greenwich mean time were obtained by signals before the departure from Norway July 15, 1918, and on the arrival in Nome ust 4 and 6, 1920, and whose rates had been ascertained by numerous observations he winter-quarters At station No 4 the longitude determinations by means of the onometers were checked by observations of the moon At stations Nos. 21 and 41 agreement between the determinations of the Expedition and the longitude derived 1 the chart of the north coast of Siberia, issued by the Russian Department of Marine drographic Division) in 1914, is a good check This chart is corrected according to results from the Russian Hydrographic Expedition to the Arctic Sea by the ice-break-*Taymyr* and *Vaigach* in 1911 to 1913, and is very reliable, according to the experience he Expedition
The positions of stations Nos. 5 to 15 on Chelyuskin Peninsula and Crown Prince ei Islands are all derived from sextant observations which have been checked by dead-reckoning kept on the sledge trips The latitudes therefore are accurate

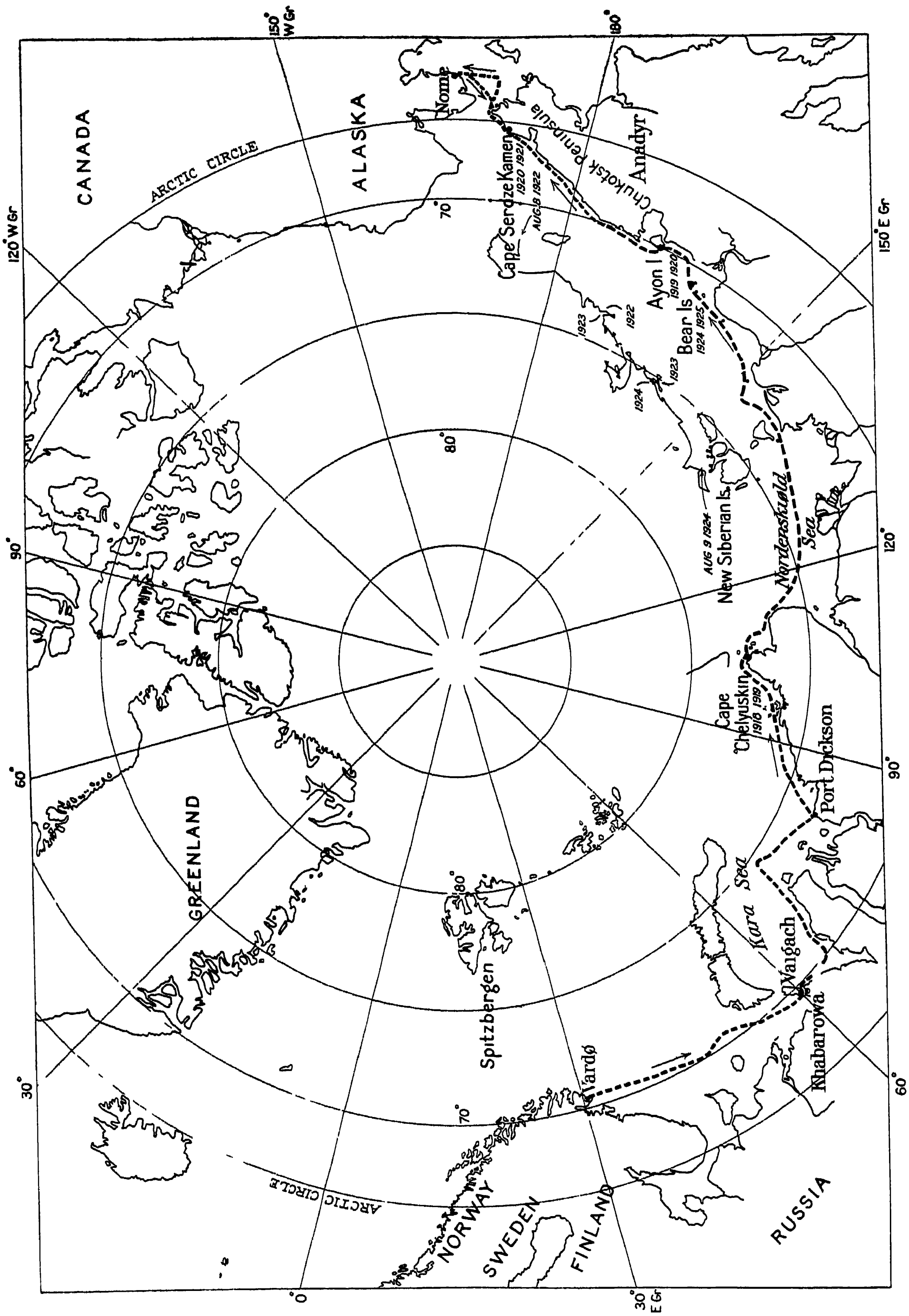


FIG 3—Arctic regions showing route and winter-quarters of the *Maud* Expedition, 1918-25
(Route of 1918-21 indicated by dashes that of drift in 1922-25 in open water shown by dots and in the drift-ice shown by full line)

within less than 1′, but errors in the longitudes, which depend upon the rates of the watches used, may be larger. The longitudes are all computed on the assumption that the adopted value for station No. 4, viz, 105° 40′ E, is correct

The positions of stations Nos 16 to 20, in the vicinity of station 4, have been obtained by a simple triangulation.

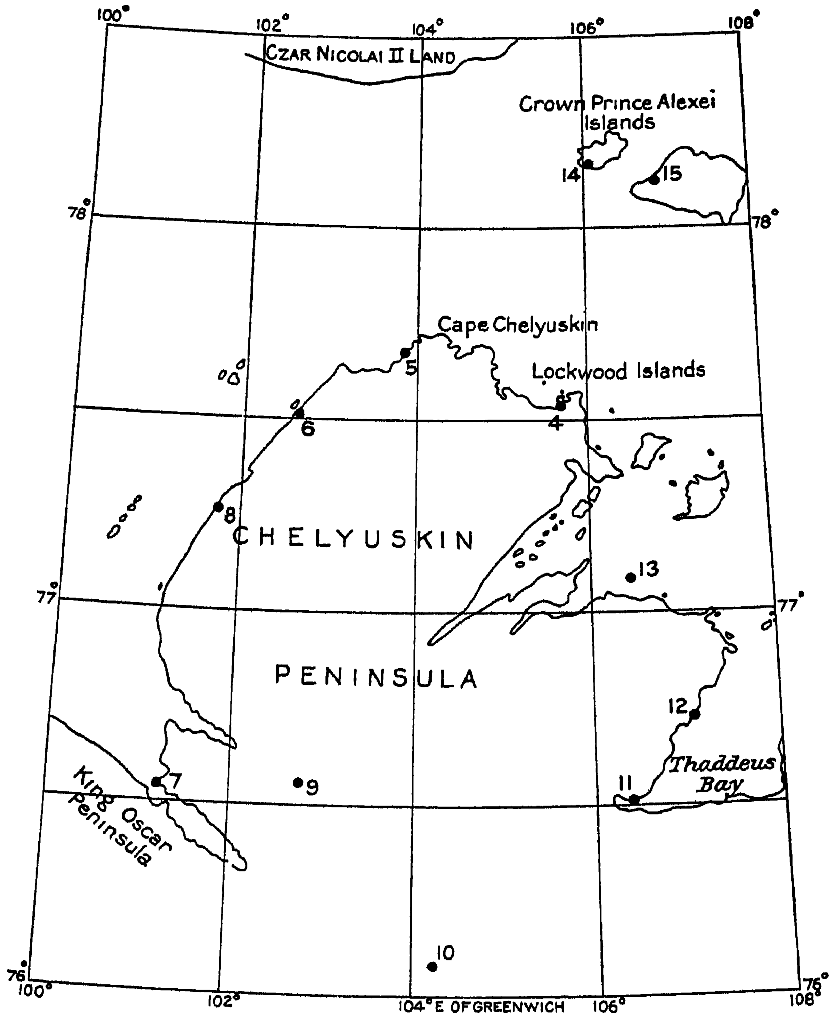


FIG 4—Distribution of the *Maud's* magnetic stations on Chelyuskin Peninsula

For stations Nos 22 to 33, along the north coast of Siberia from Bering Strait to Ayon Island, the positions have been derived from the Russian chart of the coast, which has already been mentioned. On the sledge-trip during which these stations were occupied, a distance-wheel was always used, attached to the sledge. At places which were difficult to identify on the chart, the distance, according to the distance-wheel, from the nearest conspicuous point was used to find the position The positions thus obtained have probably no greater errors than about 1′ in latitude and 3′ to 4′ in longitude

At stations Nos 34 to 40, astronomical observations were made by theodolite. The errors in the latitudes, therefore, are not more than 0′.5, but the errors in the longitude may be larger, because the longitudes depend upon watches which were carried in the field for seven and one-half months However, numerous observations made at the same stations from time to time, at intervals of about six days, show that the one watch which

was always carried on the body of the observer held its rate astonishingly well; so the longitudes are certainly not more than 5′ wrong.

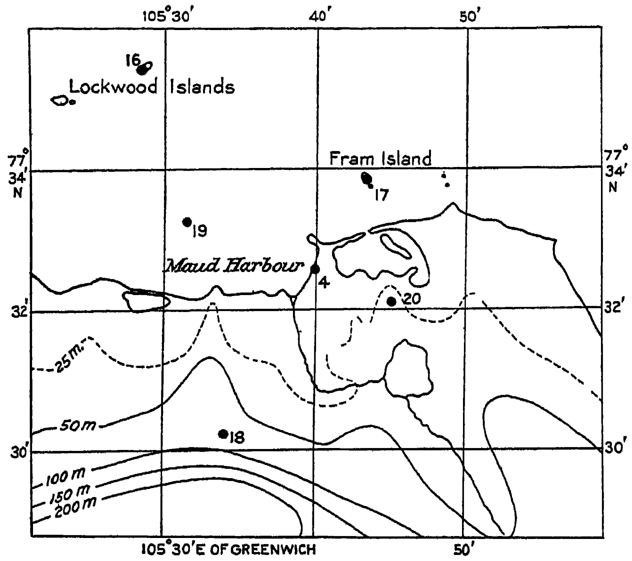


FIG 5—Distribution of magnetic stations in the vicinity of the *Maud's* winter-quarters during 1918–19

At stations Nos 42 to 53, the values of latitude and longitude have been partly taken from the Russian chart of the coast and partly determined by observations The positions observed by the Expedition show this chart to be reliable along the east coast of the Chukotsk Peninsula, and along the south coast as far as Cape Bering, west of Cape Bering, however, it is inaccurate

The results of the magnetic observations obtained during 1918 to 1921 are given in the Table of Results (see pp 332 to 336)

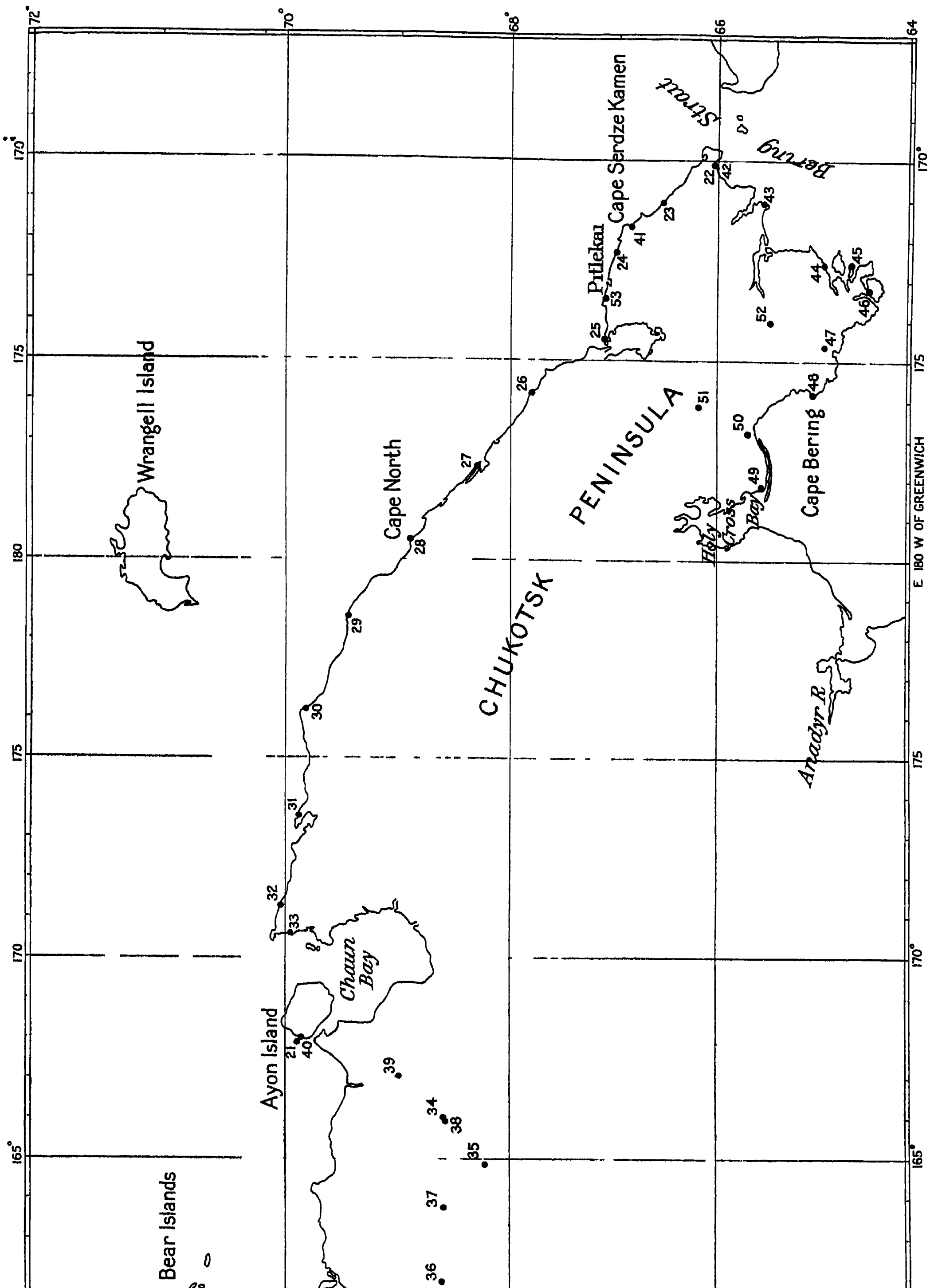


FIG 6—Distribution of the *Maud's* magnetic stations in northeastern Siberia

RESULTS OF MAGNETIC OBSERVATIONS, MAUD EXPEDITION, 1918–1921

ASIA

SIBERIA—(INCLUDING ARCTIC SEA OFF COAST)

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 14	78 09 N	106 05	Apr 21, '19			16 9	85 30 2 N				154 12	PK
No 15	78 06 N	106 45	Apr 23, 19			15 5	85 38 6 N				154 1	PK
No 5	77 42 N	103 55	Apr 4, 19			16 6	85 29 5 N	16 6	04578	205	205 123	OW
			Apr 21, 19			16 6	85 23 1 N	16 6	04699	205	205 123	OW
No 16 (Lockwood Islands)	77 35 5 N	105 29	Jul 15, 19			15 2	85 32 2 N	15 2	04559	205	205 123	OW
			Jul 15, 19			17 5	85 32 0 N	17 5	04555	205	205 567	OW
No 17 (Fram Island)	77 33 8 N	105 43	Jul 17, 19			15 1	85 32 3 N	15 1	04568	205	205 123	OW
			Jul 17, 19			17 0	85 33 0 N	17 0	04543	205	205 567	OW
No 19	77 33 2 N	105 32	Jul 19, 19			10 4	85 33 1 N	10 4	04536	205	205 123	OW
			Jul 19, 19			12 3	85 33 0 N	12 3	04533	205	205 567	OW
No 4, Winter-Quarters 1918–19	77 32 6 N	105 40	Oct 1, 18	11 4	26 16 7 E					8		HUS
			Oct 5, 18	10 8,15 8	26 41 9 E			12 0,16 0	04592	8		HUS
			Oct 7, 18			13 3	85 33 4 N	13 3	04522	205	205 123	HUS
			Oct 10, 18	10 9,16 1	26 09 4 E			12 1,15 1	04537	8		HUS
			Oct 11, 18			11 5	85 33 0 N	11 5	04545	205	205 123	HUS
			Oct 18, 18	11 0,18 0	26 49 0 E			12 2,16 8	04582	8		HUS
			Oct 19, 18			11 7	85 33 9 N	11 6	04545	205	205 123	HUS
			Oct 24, 18			13 4	85 31 6 N	13 4	04559	205	205 123	HUS
			Oct 26, 18	11 1	26 49 4 E			15 4	04583	8		HUS
			Nov 1, 18			13 9	85 31 8 N				205 12	HUS
			Nov 2, 18	10 3	27 07 8 E					8		HUS
			Nov 5, 18	11 9	26 45 5 E			15 4,17 8	04606	8		HUS
			Nov 13, 18			16 8	85 30 0 N	16 8	04589	205	205 123	HUS
			Nov 19, 18			11 6	85 29 1 N	11 7	04605	205	205 123	HUS
			Nov 22, 18			15 7	85 31 8 N	15 7	04561	205	205 123	RA
			Nov 25, 18			10 8	85 30 9 N	10 8	04574	205	205 123	RA
			Nov 26, 18					11 8,16 6	04564	8		HUS
			Nov 27, 18			11 0	85 30 4 N	11 0	04599	205	205 123	RA
			Nov 28, 18			10 8	85 29 5 N	10 8	04614	205	205 123	RA
			Nov 29, 18			10 5	85 32 7 N	10 5	04548	205	205 123	RA
			Nov 30, 18			10 7	85 31 4 N	10 7	04569	205	205 123	RA
			Dec 2, 18			10 9	85 31 7 N	10 9	04580	205	205 356	RA
			Dec 2, 18	12 3	26 37 4 E					8		RA
			Dec 3, 18	10 4,16 2	27 01 0 E			11 5,15 5	04533	8		RA
			Dec 4, 18			10 9	85 31 5 N	10 8,15 7	04618	205	205 127	RA
			Dec 4, 18	16 8	26 24 1 E	15 7	85 28 5 N			8	205 567	RA
			Dec 5, 18	10 0,15 1	26 43 2 E	11 1	85 30 8 N			8	205 123	RA
			Dec 5, 18			16 2	85 33 6 N	11 1	04574	205	205 567	RA
			Dec 6, 18	10 2,16 4	26 42 8 E			11 0,15 7	04567	8		RA
			Dec 7, 18			11 2	85 30 4 N	10 8,11 7	04579	205	205 123	RA
			Dec 7, 18			11 4	85 31 2 N				205 567	RA
			Dec 9, 18			10 9	85 29 9 N	10 9,15 8	04580	205	205 123	RA
			Dec 9, 18	12 0,16 9	27 18 2 E	15 7	85 30 5 N			8	205 567	RA
			Dec 10, 18			11 2	85 32 3 N	11 3,16 0	04594	205	205 127	RA
			Dec 10, 18	12 3	26 23 2 E	15 6	85 26 7 N			8	205 567	RA
			Dec 11, 18	14 4	26 23 2 E					8		RA
			Dec 12, 18			11 0,12 4	85 29 7 N	11 0,12 4	04608	205	205 123	RA
			Dec 12, 18			15 4,16 7	85 30 4 N	15 4,16 7	04604	205	205 567	RA
			Dec 12, 18	14 4,17 5	26 37 9 E					8		RA
			Dec 13, 18	9 9,12 6	26 24 2 E					8		RA
			Dec 13, 18			11 5	85 31 1 N	11 5	04567	205	205 123	RA
			Dec 13, 18	14 7,16 8	26 30 6 E					8		RA
			Dec 14, 18	9 8,12 7	26 33 6 E			10 6,12 1	04572	8		RA
			Dec 16, 18	9 8,12 4	26 38 7 E			10 5,11 8	04566	8		RA
			Dec 16, 18			15 5	85 31 2 N	15 5	04581	205	205 127	RA
			Dec 16, 18			16 8	85 32 3 N	16 8	04547	205	205 356	RA
			Dec 17, 18	9 7,12 5	26 36 8 E			10 4,11 8	04559	8		RA
			Dec 17, 18			15 4	85 31 6 N	15 4	04559	205	205 356	RA
			Dec 17, 18			16 8	85 28 9 N	16 8	04601	205	205.127	RA
			Dec 18, 18	9 8,12 5	26 33 6 E			10 5,11 9	04558	8		RA
			Dec 18, 18			15 4	85 29 5 N	15 4	04594	205	205 123	RA
			Dec 18, 18			16 8	85 28 0 N	16 8	04637	205	205.567	RA
			Dec 19, 18	9 7,12 4	26 35 8 E			10 4,11 8	04608	8		RA
			Dec 19, 18			15 8	85 31 2 N	15 8	04533	205	205 123	RA
			Dec 19, 18			15 8	85 35 4 N	15 8	04512	205	205 567	RA
			Dec 20, 18	9 7,12 4	26 53 5 E			10 4,11 8	04568	8		RA
			Dec 20, 18			15 1	85 30 7 N	15 1	04577	205	205 123	RA
			Dec 20, 18			16 7	85 30 5 N	16 7	04614	205	205 567	RA
			Dec 21, 18	9 7,12 6	26 46 1 E			10 4,12 0	04560	8		RA
			Dec 23, 18	9 8	26 58 4 E			10 5,12 0	04527	8		RA
			Dec 23, 18	15 7,15 9	26 32 2 E					8		RA
			Dec 23, 18	16 1,16 3	26 08 5 E					8		RA
			Jan 2, 19			11 2	85 32 8 N	11 3	04540	205	205 123	RA
			Jan 8, 19			16 3	85 30 2 N				205 1	RA

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
No 4 Winter-Quarters 1918–19—*Cont*	77 32 6 N	105 40	Jan 9, '19			15 8	85 33 3 N				205 12	OW
			Jan 10, 19			16 3	85 34 3 N				205 12	HH
			Jan 14, 19			16 0	85 30 2 N	16 9	*04578*	*205*	205 123	S&W
			Jan 15, 19	10 5,10 7	26 49 0 E	15 9	85 31 6 N			8	205 12	A&H
			Jan 16, 19			16 1	85 31 0 N	16 1	*04605*	*205*	205 567	S&W
			Jan 17, 19	9 2	28 01 4 E			11 1	04519	8		A&S
			Jan 17, 19			16 4	85 31 0 N	16 2	*04573*	*205*	205 3	HH
			Jan 20, 19	10 6	26 19 8 E					8		RA
			Jan 20, 19			16 4	85 32 7 N	16 7	*04545*	*205*	205 123	OW
			Jan 21, 19	9 8,11 0	26 50 8 E					8		RA
			Jan 21, 19			16 3	85 30 4 N	16 5	*04590*	*205*	205 567	HH
			Jan 22, 19			15 2	85 32 3 N				205 12	OW
			Jan 23, 19	9 9	26 20 2 E					8		HUS
			Jan 24, 19	10 2,12 6	26 34 6 E					8		RA
			Jan 24, 19			15 1	85 36 0 N	15 1	*04481*	*205*	205 3	HH
			Jan 25, 19			12 8	85 35 7 N	12 8	*04510*	*205*	205 7	W&H
			Jan 27, 19	10 5,10 7,10 9	26 36 4 E					8		RA
			Jan 27, 19	11 1,11 3,11 5	26 39 7 E					8		RA
			Jan 27, 19			16 2	85 34 6 N	16 2	*04523*	*205*	205 356	OW
			Jan 28, 19	9 8,12 3	26 34 0 E			10 5,11 8	04561	8		RA
			Jan 28, 19			16 0	85 33 5 N	16 1	*04547*	*205*	205 127	OW
			Jan 29, 19	10 1,10 3	26 28 4 E					8		RA
			Jan 30, 19	9 9,10 1	26 39 0 E					8		RA
			Jan 31, 19	9 8,12 2	26 41 1 E			10 4,11 7	04526	8		RA
			Jan 31, 19			16 1	85 31 7 N	16 1	*04583*	*205*	205 567	OW
			Feb 1, 19	10 3	26 48 3 E					8		RA
			Feb 3, 19	11 9	26 20 4 E					8		RA
			Feb 3, 19			16 1	85 31 5 N	16 1	*04553*	*205*	205 356	W&H
			Feb 4, 19			16 1	85 33 6 N	16 1	*04545*	*205*	205 127	W&H
			Feb 5, 19	10 1	26 41 6 E					8		RA
			Feb 5, 19			16 1	85 33 1 N	16 1	*04561*	*205*	205 567	W&H
			Feb 6, 19	10 0,10 2	26 43 8 E					8		RA
			Feb 6, 19			15 3	85 33 4 N	15 3	*04544*	*205*	205 127	HUS
			Feb 7, 19	10 1,10 2	26 32 9 E					8		RA
			Feb 7, 19			15 7	85 32 2 N	15 8	*04554*	*205*	205 123	OW
			Feb 10, 19			16 0	85 32 1 N	16 0	*04570*	*205*	205 567	HH
			Feb 11, 19			15 8	85 32 0 N	15 9	*04562*	*205*	205 123	OW
			Feb 12, 19	10 0,12 7	26 46 1 E			10 8,12 1	04548	8		HUS
			Feb 12, 19			16 0	85 34 0 N	16 1	*04533*	*205*	205 127	HH
			Feb 13, 19			16 2	85 29 1 N	16 2	*04593*	*205*	205 356	OW
			Feb 14, 19			16 1	85 29 0 N	16 2	*04611*	*205*	205 567	HH
			Feb 17, 19			15 9	85 29 2 N	16 0	*04607*	*205*	205 356	OW
			Feb 18, 19			15 9	85 29 5 N	15 9	*04613*	*205*	205 123	HH
			Feb 19, 19			15 8	85 33 2 N	15 8	*04547*	*205*	205 567	OW
			Feb 20, 19	14 8,17 6	26 25 0 E			15 5,17 0	04602	8		HUS
			Feb 21, 19			15 7	85 28 3 N	15 7	*04678*	*205*	205 123	HH
			Feb 24, 19			15 7	85 32 0 N	15 7	*04564*	*205*	205 567	OW
			Feb 25, 19			15 6	85 32 6 N	15 7	*04579*	*205*	205 3	HH
			Feb 26, 19			15 7	85 31 0 N	15 7	*04587*	*205*	205 567	OW
			Feb 27, 19			11 2	85 31 5 N	11 2	*04601*	*205*	205 127	HH
			Feb 27, 19	14 9,17 9	26 09 2 E			15 6,17 1	04648	8		HUS
			Feb 28, 19			16 0	85 28 8 N	16 1	*04601*	*205*	205 356	OW
			Mar 3, 19			11 3	85 31 4 N	11 5	*04574*	*205*	205 127	HH
			Mar 5, 19			16 1	85 30 1 N	16 2	*04584*	*205*	205 356	OW
			Mar 6, 19			15 8	85 32 6 N	15 7	*04549*	*205*	205 567	HH
			Mar 7, 19			15 9	85 33 5 N				154 12	HUS
			Mar 11, 19	9 7,12 8	26 40 4 E			10 4,12 1	04538	8		HUS
			Mar 12, 19			11 4	85 36 0 N				154 12	OW
			Mar 13, 19			16 3	85 33 4 N				154 12	HH
			Mar 14, 19	16 4,16 6	26 38 2 E	11 5	85 33 6 N			8	154 12	S&W
			Mar 17, 19			10 8	85 42 4 N				154 12	HH
			Mar 18, 19			10 5	85 36 1 N				154 12	OW
			Mar 19, 19			11 0	85 34 6 N				154 12	HH
			Mar 20, 19	9 7	28 18 8 E	10 4	85 30 5 N			8	154 12	HUS
			Mar 21, 19			10 8	85 41 0 N				154 12	HH
			Mar 24, 19	10 2,12 7	26 53 6 E			10 8,12 1	04510	8		HUS
			Mar 25, 19			10 8	85 32 8 N				154 12	HH
			Mar 27, 19	14 5,17 2	26 25 4 E			15 3,16 6	04544	8		HUS
			Apr 4, 19	14 3,17 0	26 35 2 E			15 0,16 4	04758	8		RA
			Apr 7, 19	14 7,17 4	26 26 0 E			15 6,16 3	04692	8		RA
			Apr 9, 19	14 9,17 4	25 53 1 E			15 6,16 9	04646	8		RA
			Apr 11, 19	14 7,17 0	26 20 4 E			15 3,16 5	04650	8		RA
			Apr 14, 19	14 5,17 0	25 33 4 E			15 1,16 4	04532	8		RA
			Apr 16, 19	14 7,17 0	26 29 0 E			15 3,16 5	04581	8		RA
			Apr 18, 19	15 0,17 2	26 20 4 E			15 6,16 7	04571	8		RA

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		*h* *h* *h*	° ′	*h* *h*	° ′	*h* *h*	*c g s*			
No 4, Winter-Quarters 1918–19—*Con*	77 32 6 N	105 40	Apr 21, '19	15 0,17 2	25 58 9 E			15 6,16 7	04632	8		RA
			Apr 24, 19	14 7,16 9	26 25 6 E			15 3,16 4	04542	8		RA
			Apr 28, 19	9 8,12 1	26 38 0 E			10 5,11 6	04524	8		RA
			May 2, 19	9 9	28 23 6 E					8		RA
			May 5, 19	10 1	29 42 7 E					8		RA
			May 7, 19	9 7,12 5	26 49 5 E			10 3,11 3	04529	8		RA
			May 9, 19	9 7,11 9	26 48 4 E			10 3,11 4	04482	8		RA
			May 12, 19	9 8,11 9	26 49 8 E			10 3,11 4	04521	8		RA
			May 14, 19	9 7, 9 9	27 01 0 E					8		RA
			May 16, 19	10 1,12 2	27 06 0 E			10 7,11 7	04558	8		RA
			May 19, 19	9 9	26 53 7 E			10 5,11 5	04518	8		RA
			May 21, 19	9 7,11 8	27 25 8 E			10 3,11 3	04540	8		RA
			May 23, 19	9 8,11 9	26 45 3 E			10 4,11 4	04521	8		RA
			May 26, 19	9 9,12 3	27 22 1 E			10 5,11 7	04505	8		RA
			May 28, 19	9 8,12 3	26 48 8 E			11 0	04497	8		RA
			May 30, 19	9 8,12 0	26 52 0 E			10 4,11 4	04506	8		RA
			Jun 3, 19	9 7,12 2	26 51 4 E			10 3,11 5	04482	8		RA
			Jun 6, 19	9 8,11 9	26 44 7 E			10 4,11 4	04493	8		RA
			Jun 10, 19	9 9,12 3	27 15 3 E			10 5,11 7	04534	8		RA
			Jun 13, 19	9 7,12 0	26 48 6 E			10 2,11 4	04496	8		RA
			Jun 17, 19	9 5,11 6	26 59 6 E			10 1,11 0	04512	8		RA
			Jun 20, 19	9 7,11 8	26 59 0 E			10 3,11 3	04492	8		RA
			Jun 24, 19	9 8,12 0	27 11 2 E			10 4,11 4	04636	8		RA
			Jun 27, 19	10 0,12 2	26 50 3 E			10 5,11 6	04496	8		RA
			Jul 1, 19	9 9,12 0	26 55 0 E			10 4,11 5	04510	8		RA
			Jul 3, 19	14 4,16 5	25 33 0 E			15 0,16 0	04560	8		RA
			Jul 8, 19	14 5,16 7	26 07 6 E			15 0,16 1	04654	8		RA
			Jul 11, 19	10 0,12 2	26 48 8 E			10 6,11 6	04510	8		RA
			Jul 12, 19	9 8,12 0	26 44 7 E			10 4,11 5	04548	8		RA
			Jul 15, 19	14 8,17 0	26 25 8 E			15 4,16 4	04526	8		RA
			Jul 17, 19	14 8,17 0	25 57 6 E			15 4,16 4	04548	8		RA
			Jul 18, 19	14 9,17 1	25 49 0 E			15 5,16 6	04678	8		RA
			Jul 19, 19	9 4,11 5	27 16 8 E			10 0,11 1	04484	8		RA
			Jul 21, 19	14 3,16 5	26 32 4 E			14 9,16 0	04492	8		RA
			Jul 22, 19	14 6,16 9	25 37 6 E			15 2,16 4	04712	8		RA
			Jul 25, 19	9 9	26 58 3 E			10 2	04495[1]	8		RA
			Jul 29, 19	9 6,11 8	26 40 9 E			10 1,11 3	04490	8		RA
			Jul 31, 19	14 6,16 9	26 09 1 E			15 2,16 4	04576	8		RA
			Aug 6, 19	14 9,17 0	26 22 2 E			15 4,16 5	04532	8		RA
			Aug 11, 19	9 8	27 14 5 E					8		RA
No 4*b*, Winter-Quarters 1918–19	77 32 6 N	105 40	Mar 7, 19			16 2	85 33 9 N				205 12	OW
			Mar 10, 19			11 6	85 33 9 N	11 6	*04528*	*205*	205 567	HH
			Mar 11, 19			11 5	85 33 3 N	11 5	*04538*	*205*	205 127	OW
			Mar 12, 19			11 6	85 32 5 N	11 7	*04548*	*205*	205 356	HH
			Mar 13, 19			16 2	85 32 2 N	16 2	*04567*	*205*	205 127	OW
			Mar 14, 19			11 3	85 31 3 N	11 3	*04570*	*205*	205 356	HH
			Mar 17, 19			11 3	85 39 9 N	11 3	*04437*	*205*	205 127	OW
			Mar 18, 19			11 4	85 34 0 N	11 4	*04519*	*205*	205 356	HH
			Mar 19, 19			11 6	85 34 0 N	11 6	*04531*	*205*	205 127	OW
			Mar 20, 19			11 2	85 33 2 N	11 2	*04545*	*205*	205 567	HH
			Mar 21, 19			11 5	85 39 0 N	11 5	*04437*	*205*	205 127	OW
			Mar 24, 19			11 5	85 35 2 N	11 4	*04514*	*205*	205 567	HH
			Mar 25, 19			11 4	85 33 6 N				205 12	OW
			Mar 27, 19			15 7	85 33 3 N	15 7	*04556*	*205*	205 127	HH
			Apr 4, 19			15 8	85 35 6 N				154 12	HUS
			Apr 7, 19			15 7	85 27 6 N				154 12	HUS
			Apr 9, 19			16 2	85 28 0 N				154 12	HUS
			Apr 11, 19			16 6	85 27 1 N				154 12	HUS
			Apr 14, 19			15 3	85 33 6 N				154 12	HUS
			Apr 16, 19			16 6	85 31 0 N				154 12	PK
			Apr 24, 19			16 1	85 33 5 N	16 0	*04538*	*205*	205 567	OW
			Apr 28, 19			11 3	85 33 9 N	11 4	*04530*	*205*	205 127	OW
No 4*c*, Winter-Quarters 1918–19	77 32 6 N	105 40	Apr 28, 19			11 4	85 35 0 N				154 12	PK
			May 28, 19			11 5	85 34 5 N	11 5	*04522*	*205*	205 567	OW
			May 30, 19			11 1	85 35 2 N	11 1	*04500*	*205*	205 123	OW
			July 11, 19			11 1	85 33 9 N	11 1	*04524*	*205*	205 123	OW
			Jul 12, 19			10 8	85 32 5 N	10 8	*04544*	*205*	205 123	OW
			Jul 12, 19			12 7	85 32 4 N	12 7	*04552*	*295*	205 567	OW
			Jul 22, 19			15 2	85 26 7 N	15 1	*04647*	*205*	205 123	OW
			Jul 22, 19			17 0	85 21 7 N	17 0	*04714*	*205*	205 567	OW
			Jul 25, 19			10 3	85 35 2 N	10 2	*04503*	*205*	205 123	OW
			Jul 29, 19			10 3	85 35 7 N	10 4	*04495*	*205*	205 123	OW
			Jul 29, 19			11 9	85 34 0 N	11 9	*04513*	*205*	205 567	OW
			Aug 6, 19			15 7	85 32 5 N	15 7	*04543*	*205*	205 567	OW

[1] Oscillations only

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 20	77 32 1 N	105 45	Jul 21, '19			14 9	85 29 6 N	14 9	*04622*	*205*	205 123	OW
			Jul 21, 19			16 7	85 30 8 N	16 7	*04597*	*205*	205 567	OW
No 6	77 32 N	102 44	Apr 7, 19			16 7	85 25 5 N	16 7	*04673*	*205*	205 567	OW
No 18	77 30 2 N	105 34	Jul 18, 19			15 3	85 00 7 N	15 3	*05131*	*205*	205 123	OW
			Jul 18, 19			17 4	84 59 3 N	17 4	*05129*	*205*	205 567	OW
No 8	77 16 N	101 45	Apr 19, 19			16 0	85 09 4 N	16 0	*04967*	*205*	205 567	OW
No 13	77 05 N	106 21	May 24, 19			10 6	85 24 0 N	10 6	*04712*	*205*	205 123	OW
No 12	76 43 N	107 03	May 21, 19			11 1	85 15 5 N	11 1	*04863*	*205*	205 567	OW
No 9	76 34 N	102 47	May 14, 19			11 4	84 59 7 N	11 5	*05125*	*205*	205 123	OW
No 7	76 32 N	101 15	Apr 14, 19			16 9	85 03 0 N	16 9	*05072*	*205*	205 123	OW
No 11	76 31 N	106 13	May 20, 19			11 8	85 15 6 N	11 8	*04856*	*205*	205 123	OW
No 10	76 05 N	104 11	May 16, 19			11 4	85 03 5 N	11 4	*05070*	*205*	205 567	OW
No 3 (Port Dickson)	73 30 2 N	80 26	Sep 2, 18	12 5,20 2	28 41 E			16 5,19 3	07512	8		HUS
			Sep 3, 18	18 2	28 48 E	19 4	82 37 7 N	20 0	*07485*	*205*	205 123	HUS
No 32	70 03 N	171 15	Jun 8, 20			12 6	78 20 4 N	12 7	*11580*	*205*	205 356	OW
No 33	69 56 N	170 35	Jun 12, 20			3 0	78 23 3 N	3 0	*11525*	*205*	205 123	OW
No 31	69 54 N	173 30	Jun 6, 20			3 4	78 18 0 N	3 4	*11585*	*205*	205 123	OW
No 21 (Ayon Island), Winter-Quarters 1919–20	69 52 5 N	167 52	Oct 29, 19			11 1	78 20 9 N	11 1	*11583*	*205*	205 123	OW
			Nov 5, 19			11 4	78 21 2 N				205 56	OW
			Nov 12, 19			11 5	78 23 4 N	11 5	*11571*	*205*	205 123	OW
			Nov 19, 19			11 5	78 19 5 N	11 5	*11609*	*205*	205 356	OW
			Jun 18, 20			11 3,12 6	78 21 6 N	11 3	*11551*	*205*	205 12356	OW
No 40 (Ayon Island)	69 51 2 N	167 57	Jun 16, 20	17 1,19 2	3 34 0 E	20 0	78 21 0 N	17 7,18 7	11661	8	154 12	HUS
			Jun 17, 20	12 9,14 9	3 19 0 E	15 8	78 18 4 N	13 5,14 4	11593	8	154 12	HUS
No 30	69 50 N	176 30	Jun 4, 20			3 9	78 07 4 N	3 9	*11741*	*205*	205 356	OW
No 29	69 27 N	178 35	Jun 2, 20			4 3	77 56 0 N	4 3	*11895*	*205*	205 123	OW
No 39	69 00 8 N	167 04	May 7, 20	11 5	2 25 5 E	17 1	77 36 1 N	13 0,14 4	12254	8	154 12	HUS
No. 28	68 55 N	180 31	May 31, 20			6 3	77 30 8 N	6 3	*12277*	*205*	205 356	OW
No 37	68 36 7 N	163 45	Apr 11, 20	13 7,16 2	0 16 2 W			14 4,15 7	12384	8		HUS
			Apr 12, 20	10 1,10 3	0 02 6 W	13 3	77 32 4 N			8	154 12	HUS
No 36 (Panteleika)	68 36 1 N	161 55	Apr 1, 20	10 8,14 7	1 17 2 W	17 1	77 49 2 N	12 0,14 0	12033	8	154 12	HUS
			Apr 2, 20	11 9,15 6	1 16 2 W	16 8	77 48 2 N	12 5,14 6	12038	8	154 12	HUS
No 34	68 36 N	166 00	Nov 5, 19					14 5	12296	8		HUS
			Nov 6, 19			14 4	77 33 5 N	10 3,11 6	12304	8	154 12	HUS
No 38	68 34 3 N	165 56	Apr 28, 20	9 0,11 5	1 13 5 E	13 6	77 32 8 N	9 7,10 9	12389	8	154 12	HUS
No 27	68 18 N	182 20	May 27, 20			15 4	77 06 1 N	15 4	*12631*	*205*	205 123	OW
No 35	68 13 6 N	164 52	Dec 24, 19	12 8	0 52 5 E					8		HUS
			Dec 31, 19	10 1,12 9	0 30 5 E[2]			11 8	12732	8		HUS
			Jan 1, 20			12 2	77 08 4 N				154 12	HUS
			Jan 7, 20	11 1	0 49 8 E			11 9	12728	8		HUS
			Jan 21, 20	9 9,12 5	0 46 2 E			10 6,12 0	12734	8		HUS
			Jan 24, 20			10 6	77 10 1 N				154 12	HUS
			Jan 28, 20	11 0,13 6	0 52 0 E	14 8	77 08 4 N	11 6,13 0	12734	8	154 12	HUS
			Feb 4, 20	13 6	0 47 0 E			14 3,15 6	12734	8		HUS
			Feb 11, 20	9 6,14 1	0 54 2 E	15 2	77 10 6 N	10 5,13 5	12740	8	154 12	HUS
			Feb 18, 20	9 9,12 4	0 47 6 E	14 5	77 10 0 N	10 5,11 8	12722	8	154 12	HUS
			Feb 25, 20	10 8,14 0	0 42 0 E			11 4,13 5	12730	8		HUS
			Mar 3, 20	10 0,13 5	0 50 3 E	15 0	77 09 0 N	10 9,12 8	12727	8	154 12	HUS
No 26	67 49 N	184 10	May 25, 20			12 5	76 40 8 N	12 5	*13047*	*205*	205 356	OW
No 25	67 15 N	185 20	May 24, 20			18 3	76 16 5 N	18 3	*13450*	*205*	205 123	OW
No 53 (Pitlekai)	67 06 3 N	186 29	Apr 13, 21	12 7,14 6	15 03 E	13 7	76 26 2 N	13 7	*13213*	*205*	205 123	HUS
No 24	67 01 N	187 45	May 22, 20			15 4	76 12 9 N	15 4	*13409*	*205*	205 356	OW
No 41 (Cape Serdze Kamen), Winter-Quarters 1920–21	66 53 2 N	188 21	Nov 29, 20					11 5,12 8	13394	8		HUS
			Dec 1, 20			12 0	76 14 0 N	11 7,11 8	*13380*	*205*	205 123	HUS
			Dec 2, 20			11 5	76 13 1 N	11 5	*13411*	*205*	205 123(7)	HUS
			Dec 6, 20			11 9	76 14 1 N	11 9	*13407*	*205*	205 123(7)	HUS
No 41*b* (Cape Serdze Kamen), Winter-Quarters 1920–21	66 53 0 N	188 21	Jan 7, 21	10 5	16 38 E	12 0	76 15 8 N	12 0	*13346*	*205*	205 123	HUS
			Jan 12, 21	10 7	16 31 E	12 6	76 15 4 N	12 6	*13353*	*205*	205 123(7)	HUS
			Jan 13, 21	11 2	16 36 0 E			11 9,13 4	13352	8		HUS
			Jan 19, 21	10 7,13 8	16 38 E	12 2	76 15 8 N	12 2	*13350*	*205*	205 123(7)	HUS
			Jan 22, 21	10 8,13 4	16 35 0 E			11 4,12 8	13352	8		HUS
			Jan 25, 21	11 2,13 7	16 32 E	12 4	76 15 2 N	12 4	*13354*	*205*	205 123(7)	HUS
No 41*c* (Cape Serdze Kamen)	66 53 0 N	188 21	Apr 26, 21	13 8,16 6	16 39 2 E			14 4,15 8	13344	8		HUS
No 41*d* (Cape Serdze Kamen)	66 53 0 N	188 21	Apr 26, 21	13 5,17 8	16 40 E	15 4	76 16 9 N	15 2	*13330*	*205*	205 123	OW
			Apr 26, 21			16 1	76 16 2 N	16 2	*13339*	*205*	205 56(7)	OW
No 23	66 32 N	189 00	May 18, 20			16 5	76 06 0 N	16 5	*13509*	*205*	205 123	OW
No 51	66 10 N	183 50	Mar 15, 21	12 3	13 29 E	13 0	75 35 7 N	13 0	*13949*	*205*	205 123	HUS

[2] Magnetic storm

ASIA

SIBERIA (INCLUDING ARCTIC SEA OFF COAST)—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 22 (Kain-ge-skon)	66 03 N	189 50	Mar 3, '20			11 6	75 36 6 N	11 5	*13929*	*205*	205 123	OW
			Mar 9, 20			12 1	75 37 3 N	12 1	*13925*	*205*	205 356	OW
			Mar 23, 20			12 4	75 35 4 N	12 5	*13969*	*205*	205 123	OW
			Mar 25, 20			15 6	75 38 7 N	15 6	*13899*	*205*	205 123	OW
			Apr 5, 20			15 6	75 34 8 N	15 6	*13975*	*205*	205 123	OW
			Apr 6, 20			12 3	75 38 0 N	12 3	*13899*	*205*	205 356	OW
			Apr 12, 20			11 9	75 37 3 N	12 0	*13928*	*205*	205 123	OW
			Apr 13, 20			11 8	75 36 9 N	11 8	*13924*	*205*	205 356	OW
			Apr 23, 20			13 6	75 35 5 N	13 7	*13937*	*205*	205 123	OW
No 42 (Kain-ge-skon)	66 03 N	189 50	Feb 4, 21	11 0	17 33 E	12 4	75 40 2 N	12 4	*13819*	*205*	205 123	HUS
No 50	65 39 N	183 06	Mar 13, 21			7 5	74 56 5 N	7 5	*14476*	*205*	205 123	S&W
No 49 (Mass-kan)	65 31 2 N	181 25	Mar 8, 21	10 9,12 4	10 09 E	11 7	74 59 2 N	11 7	*14460*	*205*	205 123	S&W
No 43 (Yan-dang-ai)	65 30 N	188 55	Feb 9, 21	10 3	15 16 E	11 4	75 09 5 N	11 4	*14266*	*205*	205 123	S&W
No 52	65 28 N	185 55	Mar 29, 21			12 6	75 05 5 N	12 6	*14344*	*205*	205 123	HUS
No 48 (An-ma-la)	65 01 4 N	184 12	Mar 1, 21			11 8	74 15 2 N	11 8	*15106*	*205*	205 123	S&W
			Mar 21, 21	11 4,16 3	11 34 E	14 2	74 16 3 N	13 2	*15076*	*205*	205 125	S&W
			Mar 21, 21			14 2	74 15 5 N	15 2	*15094*	*205*	205 36(7)	S&W
No 44 (Jan-da-ken-nut)	64 54 N	187 25	Feb 14, 21	9 6,11 4	16 04 E	10 5	74 40 1 N	10 5	*14772*	*205*	205 123	S&W
No 47	64 50 N	185 25	Feb 23, 21			12 3	74 26 3 N	12 3	*14905*	*205*	205 123	S&W
No 45 (Nabba-kotta)	64 34 N	187 28	Feb 17, 21			13 9	74 24 9 N	14 0	*14861*	*205*	205 123	S&W
No 46 (Emma Harbor)	64 24 N	186 48	Feb 20, 21	13 1,14 7	14 29 E	13 9	74 13 9 N	13 9	*15040*	*205*	205 123	S&W

EUROPE

RUSSIA

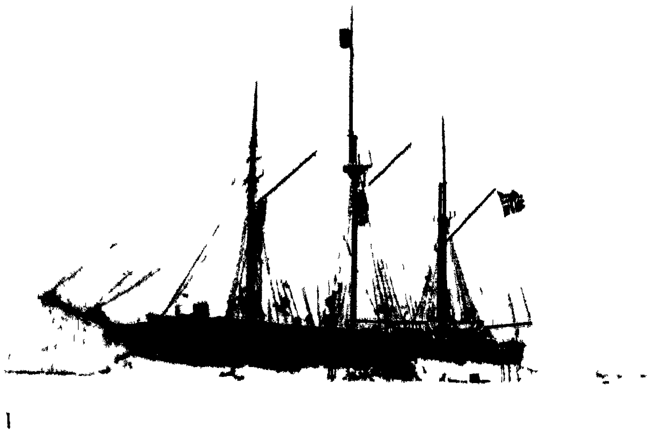
Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
1 (Vaigach)	69 41 5 N	60 12	Aug 12, '18	15 0,18 1	20 07 8 E			16 0,17 4	10912	8		RA
2 (Khabarowa)	69 39 8 N	60 24	Aug 13, 18	10 1	20 25 4 E	12 0	78 40 8 N	12 2	*10878*	*205*	205 123	RA
			Aug 15, 18	11 6,14 4	19 56 8 E			12 5,13 9	10910	8		RA
			Aug 15 18	16 6	19 50 0 E	17 6	78 37 4 N	17 6	*10941*	*205*	205 123	RA

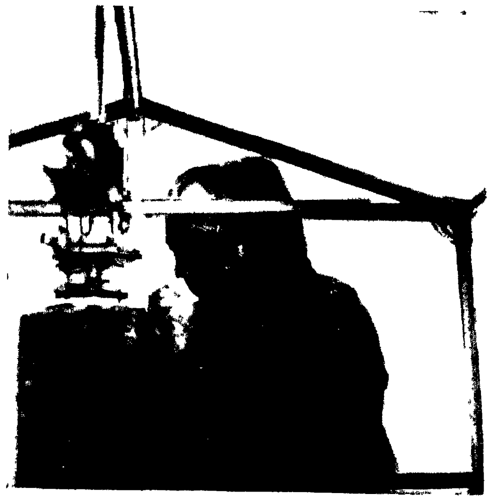
DESCRIPTIONS OF STATIONS

In general, the topography of the regions in the neighborhood of the stations, the absence of prominent marks and buildings, and the meteorological conditions prevailing made infeasible detailed descriptions such as would permit precise recovery of all the points It is hoped that the following descriptions, although necessarily meager, will suffice, in connection with the maps and narrative (see Figs 3 to 6 and p 514), for possible future reoccupations to determine secular variation

The descriptions are given in numerical order under the geographical divisions adopted in the Table of Results The general form followed in the descriptions is Number of station according to the order of occupation by the Expedition, local name, if any, of station in parentheses, general and detailed location with distances and references whenever possible, manner of marking, and, finally, the true bearings of prominent objects likely to be of value All bearings, unless specifically stated otherwise, are true ones, and are reckoned continuously from 0° to 360° in the direction south, west, north, east When no mention is made of the marking of a station, it is to be understood that the station was either not marked at all or not in a permanent manner

PLATE 6





TYPICAL VIEWS ON THE "MAUD" EXPEDITION

1 The *Maud* at Maud Harbor
2 Captain Amundsen observing with magnetometer
3 Captain Wisting observing at Station 5, April, 1919
4 Dog-sledge used for transportation
5 Winter-quarters at Maud Harbor, 1918-1919, absolute station and registering-house at right, auxiliary station at left, *Maud* in center
6 Magnetic station at Panteleika, Siberia, April 1920, showing method of setting up tent

ASIA

SIBERIA

Station No 3 (Port Dickson), 1918—Southwest of radio station True bearings radio mast, 241° 33′, conspicuous stone on summit of hill seen beyond a small island, 267° 01′ A mound of stones was built upon site of station

Station No 4, Winter-Quarters, 1918–1919—Off north coast of Chelyuskin Peninsula are two small islands, called Lockwood Islands by Fridtjof Nansen, in latitude 77° 35′N and longitude about 105° 40′ east of Greenwich A large cairn was built on the north-eastern island and contains full information regarding the winter-quarters of the *Maud* during 1918–1919, and the place where the magnetic observations were made The winter-quarters were 7 kilometers south 40° east from the cairn on the shore of bay opening to the northwest The magnetic observatory (designated station No 4) was erected 14 meters from the water, on the eastern shore, which runs south-southwest to north-northeast for about 1 5 kilometers and almost at the middle of this stretch A wooden post on which the magnetometer was permanently mounted during winter of 1918–1919 was left in place, this post was driven as far down as the frozen ground permitted, and at conclusion of work was surrounded with stones and covered with a copper plate inscribed "Magn obsv *Maud* expedition 1918–1920" Two arrows engraved on the place show the south and direction of mark The mark was a driftwood log, built in cairn on top of small cape about 600 meters distant The astronomical station was about 40 meters south of magnetic observatory and is also marked with a wooden post driven into the ground, surrounded by stones and covered with a copper plate

Station No 4*b* was 16 meters north 47° east of station No 4.

Station No 4*c* was 26 meters south 3° west of station No 4

Stations Nos 5 to 15, 1919—As it was impossible to erect any permanent marks to indicate the stations, no descriptions suitable for relocation purposes can be given The approximate latitudes and longitudes are all derived from sextant observations, checked by the dead reckoning which was kept up on the sledge-trips, the longitudes depend upon the adopted value of 105° 40′ east of Greenwich for station No 4 Station No 13 was located on the sea-ice, about 5 kilometers from the coast, the others are on land

Station No 16 (Lockwood Islands), 1919—On north-eastern of the Lockwood Islands, close to the cairn of Expedition, 7 kilometers north 40° west from station No 4

Station No 17 (Fram Island), 1919—On the middle of Fram Island, 2 8 kilometers north 30° east from station No 4

Station No 18, 1919—Under the hills, 4 9 kilometers south 28° west from station No 4

Station No 19, 1919—On the sea-ice, 3 5 kilometers north 70° west from station No 4

Station No 20, 1919—On a low ridge of clay, 2 2 kilometers south 66° east from station No 4

Station No 21 (Ayon Island), Winter-Quarters, 1919–1920—On the ice close to where the *Maud* was frozen in off coast of Ayon Island in latitude 69° 52′5 and longitude 167° 52′ east of Greenwich About 13 kilometers north of shallow strait separating Ayon Island from the mainland there is a small river in a deep valley (On older maps the

ASIA

SIBERIA—*Continued*

Station No 21 (Ayon Island), Winter-Quarters, 1919–1920—Continued

island is indicated as being divided into two parts where this valley lies, which is a mistake and which has been corrected on newer maps) The approximate location of the *Maud* was 2 5 kilometers directly off the coast at a point about 4 kilometers to the south of this valley at the first and only creek extending some distance inland

Stations Nos 22 to 33, 1920—The positions of stations Nos 22 to 33 were derived from the chart of the Siberian coast, published by the Russian Marine Department (Hydrographic Division) in 1914 On the sledge-trip on which these stations were occupied, a distance-wheel was used with the sledge and positions which, on account of the character of the coast, were difficult to derive from the charts, were obtained by applying the measured distance from the nearest conspicuous point This chart seems to be very reliable, the scaled latitudes always agreed within a fraction of a minute with observed values and the scaled longitudes are in perfect agreement with those the Expedition determined by means of chronometers The positions given should therefore be correct within 1 or 2 miles No descriptions can be furnished except for station No 22, which is the same as that occupied in 1921 and described as station No 42

Station No 34, 1919—About 3 kilometers south of entrance to narrow valley leading directly toward conspicuous cone-shaped mountain, this valley is a tributary of the Pokincha River, which flows from east to west in latitude 68° 39′ N and is about 6 kilometers east from the edge of the forest and south of the point where a deep valley from the northeast meets the Pokincha

Station No 35, 1919, 1920—Situated across the mountains, south of station No 34, on the first timbered ridge west of the northwestern top of low range of hills, rising above the forest limit, and limiting the open basin of the Machu-a-am River

Station No 36 (Panteleika), 1920—At Siberian village Panteleika, about 25 kilometers east of Nijne Kolymsk, on slope about 200 meters east-northeast from southeastern house in village True bearing spire of partially-built church, 88° 48′6 The ground was frozen, so no mark could be erected, but a Russian trader in Panteleika promised to drive down a pole to mark station in the summer

Station No. 37, 1920—In a large forest, no description possible

Station No 38, 1920—About 4 kilometers southwest of station No 34, on the ridge separating the valley in which station No 34 was located from a smaller valley to the west

Station No. 39, 1920—About 500 meters south of a small river which parallels the Rauchu-an River about 12 kilometers to southwest and is between it and the mountain Keed-leely-gool The valley is broad, but the small river follows the north side and flows close to a steep hill before turning northeast at junction with another river, the station is about 4 kilometers from the turn

Station No 40 (Ayon Island), 1920—In middle of perfectly smooth plain about 200 meters south of small creek referred to in description of station No 21.

ASIA

SIBERIA—*Continued*

Station No 41 (*Cape Serdze Kamen, Winter-Quarters,* 1920–1921—Stations *b, c,* and *d* were all close together at northern end of sand spit separating small lagoon and small open bay south of Cape Serdze Kamen and about 30 meters from the small creek which runs to the sea and forms the northern boundary of the sand spit, and about 30 meters from the sea Some native tents are usually located on the northern part of the sand spit Station No 41 was about 400 meters northeast of the others and on the accumulated snow slope covering the steep coast

Station No 42 (*Kain-ge-skon*), 1921—On flat ground above the beach 100 meters west of a large whale vertebra, which the natives worship, and southwest of the most western of stores and houses built by trading companies southwest of native village

Station No 43 (*Yan-dang-ai*), 1921—In small open creek about 70 meters southwest of trading-company store on small plain, about 10 meters above sea-level and about 200 meters northwest of native village Yan-dang-ai, which is called South Head by the traders

Station No 44 (*Jan-da-ken-nut*), 1921—On southwest side of steep cape, 3 kilometers east of native village Jan-da-ken-nut at place where coast turns abruptly to northeast, about 40 meters from shore-line and 100 meters from small brook

Station No 45 (*Nabba-kotta*), 1921—Seventy meters west-northwest of European house built by native at Eskimo village called Nabba-kotta, on smallest of islands north of Indian Point

Station No 46 (*Emma Harbor*), 1921—Fifty meters south of southwest corner of two large storehouses east of Russian Government building

Station No 47, 1921—No description

Station No 48 (*An-ma-la*), 1921—In western part of native village An-ma-la at Cape Bering, 115 meters southwest from east corner of western of two stores and 120 meters southwest from east corner of eastern store True bearing top of pinnacle on mountain side, 47° 51′

Station No 49 (*Mass-kan*), 1921—Northeast of small native village Mass-kan at Holy Cross Bay, 60 meters north of newer and farther of two houses belonging to traders

Station No 50, 1921—At middle of entrance to broad valley running north from the east end of sand spit on the south side of low ridge closing eastern part of entrance, the sand spit is about 70 kilometers long and extends eastward off coast from Holy Cross Bay

Stations Nos 51 and 52, 1921—No descriptions

ASIA

SIBERIA—*Concluded*

Station No 53 (*Pitlekai*), 1921—Approximately same as observatory station occupied by A E Nordenskiold during the wintering of the *Vega* 1878–1879, close to native tent-village Pitlekai It was about 100 meters from top of mound and 60 meters from the shore, this being location of the observatory pointed out by an old native woman, according to the natives, Nordenskiold had left a pole with an inscription here, but nothing was found of it The coast here is generally very low, with a few low mounds on which native tents are placed

CROSS REFERENCES TO STATIONS IN SIBERIA

An-ma-la, Siberia, 1921—See No 48
Ayon Island, Siberia, 1919–1920—See Nos 21 and 40
Cape Bering, Siberia, 1921—See No 48
Cape Serdze Kamen, Siberia, 1920–1921—See No 41
Emma Harbor, Siberia, 1921—See No 46
Fram Island, Siberia, 1919—See No 17
Holy Cross Bay, Siberia, 1921—See No 49 (Mass-kan) and No 50
Jan-da-ken-nut, Siberia, 1921—See No 44
Kain-ge-skon, Siberia, 1921—See No 42
Lockwood Islands, Siberia, 1918–1919—See Nos 4 and 16
Machu-a-am River, Siberia, 1919-1920—See No 35
Mass-kan, Siberia, 1921—See No 49
Nabba-kotta, Siberia, 1921—See No 45
Panteleika, Siberia, 1920—See No 36
Pitlekai, Siberia, 1921—See No 53
Pokincha River, Siberia, 1919–1920—See Nos 34 and 38
Port Dickson, Siberia, 1918—See No 3
Rauchu-an River, Siberia, 1920—See No 39
South Head, Siberia, 1921—See No 43
Winter-Quarters, Siberia, 1918–1919—See No 4
Winter-Quarters, Siberia, 1919–1920—See No 21
Winter-Quarters, Siberia, 1920–1921—See No 41
Yan-dang-ai, Siberia, 1921—See No 43

EUROPE

RUSSIA

Station No 1 (*Vaigach, or Waigatsch*), 1918—Southwest of south end of narrow isthmus extending between bay and lake, at base of short spur of land jutting into sea westward

Station No 2 (*Khabarowa*), 1918—Close reoccupation of station of August 1, 1893, of "Norwegian North Polar Expedition" On left bank of river, between river and coast, in extension of side nearest river of old chapel, 12 meters down-stream from nearest corner True bearings indentation on low mountains on east coast of Yugor Schar, 15 to 20 kilometers, 259° 10′6, a second indentation less conspicuous than former, 257° 43′5

Khabarowa, Russia, 1918—See No 2
Vaigach, Russia, 1918—See No 1
Waigatsch, Russia, 1918—See No 1

SECULAR-VARIATION DATA

Previous observations of the magnetic elements in the general region covered by the Expedition during 1918 to 1921 were made by A E Nordenskiold on the *Vega* Expedition during 1878 to 1879, and by Nansen during the Norwegian North Polar Expedition of 1893 to 1896 Table 7 shows the data obtained for the several magnetic elements by previous observers and by the *Maud* Expedition, together with the resulting values for mean annual change. It had been hoped also to obtain annual-change values at Cape Chelyuskin, but Nordenskiold's station there was apparently in a locally-disturbed area, his value for declination being 129° 09′ east, it was not feasible, therefore, to get any reliable secular-change data by comparing his results with values interpolated for his position from stations occupied on the *Maud* Expedition The data for the *Maud* Expedition values at St Laurent Bay and Konyam Bay are obtained by interpolation for the first case from values at stations Nos 42 and 43, and in the second case from values at stations Nos. 44 and 45.

TABLE 7—*Secular-Variation Data*

Station	Latitude	Long east of Gr	Authority	Date	Declination		Inclination		Hor int	
					Value	Annual change	Value	Annual change	Value	Annual change
	° ′	° ′			° ′	′	° ′	′	cgs	cgs
Port Dickson	73 30 N	80 26	Nordenskiöld	Aug 1878	26 25 E		82 55 N		08007	
			Amundsen	Sep 1918	28 43 E	3 4 E	82 38 N	0 4 S	07503	− 00013
Khabarowa	69 40 N	60 24	Nordenskiöld	Jul 1878	17 07 E				11558	
			Nansen	Aug 1893			77 38 N		11448	− 00007
			Amundsen	Aug 1918	19 54 E	4.2 E	78 37 N	2 4 N	10920	− 00021
Pitlekai	67 06 N	186 29	Nordenskiöld	Mar 1879	19 42 E		77 01 N		13188	
			Amundsen	Apr 1921	15 03 E	6 6 W	76 26 N	0 8 S	13213	+ 00001
St Laurent Bay	65 35 N	189 16	Nordenskiöld	Jul 1879	20 24 E		75 55 N		14178	
			Amundsen	Feb 1921			75 16 N	0 9 S	14210	+ 00001
Konyam Bay	64 50 N	187 03	Nordenskiöld	Jul 1879	17 52 E		75 10 N		14725	
			Amundsen	Feb 1921		..	74 32 N	0 9 S	14810	+ 00002

Part II—ABSOLUTE MAGNETIC OBSERVATIONS, 1922–1925

By H. U. Sverdrup

Instruments

In March 1922 the Department of Terrestrial Magnetism of the Carnegie Institution of Washington supplied Captain Roald Amundsen's *Maud* Expedition with the same instruments which previously had been used on this Expedition from 1918 to 1921, namely, C. I. W. magnetometer 8 and Dover dip circle 205. General information regarding these instruments, and descriptions of modifications which were made to render them more suitable for work in the Arctic, are given in Part I. The accessory equipment which is mentioned in that report remained on board the *Maud* and was supplemented in 1922 by one pocket chronometer, miscellaneous forms for recording magnetic observations, and miscellaneous supplies.

In addition to the instruments from the Department of Terrestrial Magnetism, the Expedition had also Dover land dip circle 154, with one pair of dip needles (Nos. 1 and 2), and a photographic registering declinometer made by Max Toepfer and Son, Potsdam. Registering magnetic instruments generally were not included in the equipment of the Expedition, because in the drifting ice it would not be possible to use them on account of the perpetual movements of the ice, but this declinometer, which was the property of the Expedition, was taken along in the expectation that it might be used at occasional shore stations, e. g., at winter-quarters.

For astronomical work the Expedition had two sextants, including one sextant with artificial horizon loaned by the United States Coast and Geodetic Survey, four theodolites of different sizes, three chronometers, one pocket chronometer, and seven watches, the pocket chronometer and one watch being supplied by the Department of Terrestrial Magnetism.

Methods of Observing

The magnetic observations were made, as previously, in accordance with instructions for land magnetic work prepared by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. The methods used are given in detail in volumes I, II, and IV of the *Researches* of the Department (see particularly pp. 13–41 and specimen observations, Vol. I). The previous experience of the Expedition's observers was that magnetic observations could be carried out without serious difficulties under Arctic conditions in an observatory of primitive construction. The experience during the years 1922 to 1925 confirms this, but in the drift-ice special precautions had to be taken to secure reliable results and prevent damage to instruments. It may be useful to review these briefly and also to discuss the arrangements for magnetic observations at winter quarters of 1924–1925.

WORK IN THE DRIFT-ICE, 1922-1924

In the drift-ice the magnetic observations were taken on the ice at a sufficient distance from the ship to be outside of the range of the disturbing influence of the iron masses on board. During the first few months and the last few weeks in the drift-ice the observations were taken under the open sky, from October 11, 1922, to June 26, 1923, in a house built of ice-blocks, and from July 3, 1923, to July 2, 1924, in a tent on the ice.

The greatest difficulty encountered during magnetic observations in the drift-ice arises from the perpetual movements of the ice-fields. The ice-floes are frequently turning, making fixed orientation of an instrument impossible when referred to the geo-

graphical coordinates. The movements are, however, seldom so rapid as to influence the dip-circle observations of inclination and total intensity These observations, according to instructions, were taken with the instrument oriented in the magnetic meridian Before beginning observations the direction of the magnetic meridian was determined by the compass of the dip circle, this determination was repeated after the observations in order to ascertain whether any appreciable turning of the ice-floes had taken place during the observations The results of the two determinations would generally agree within less than one-half degree, but in summer, when spaces of open water gave the ice greater freedom of motion, turning of a few degrees might take place during the one and one-half hours which ordinarily were required for the complete observation. No corrections to the observed values arising from such errors in magnetic-meridian setting have been applied, since they always have been too small to be considered The observations of the horizontal intensity by means of magnetometer 8 were never seriously affected by turning of the ice-floes and could be taken in the ordinary way, but special arrangements were necessary to obtain trustworthy observations of declination

At a land station the azimuth of a mark sighted with the telescope of the magnetic instrument remains unaltered as long as the positions of instrument and mark are the same, but in the drift-ice the azimuth of a mark is constantly subject to change on account of the movements of the ice-fields In October 1922, when the routine magnetic work was to begin, we tried to observe the magnetic declination between two astronomical determinations of the azimuth of the mark, interpolating the value of the azimuth for the moment of the magnetic observation The astronomical observations were, depending upon weather conditions, taken at intervals of one to four days We soon found, however, that this method was unsatisfactory, because the azimuth of the mark might change several degrees in the time-interval between the two determinations, and we were unable to ascertain whether the movement which caused the change was of a continuous or intermittent character Thus, interpolated values were always doubtful However, we could eliminate every uncertainty arising from the motion of the ice by observing the azimuth of the mark simultaneously with the observation of the declination This was accomplished by placing the magnetic and astronomic instruments at a suitable distance apart and having the magnetic observer use the astronomical theodolite as a mark while the astronomical observer determined the azimuth of the magnetic instrument, that is, the true direction of the line joining the two instruments In nearly all cases when observing declination with magnetometer 8 the azimuth of the mark was determined strictly simultaneously, occasionally, however, there was a time-difference of less than one-half hour between the magnetic and astronomical observations In all the latter cases the preceding and following change in azimuth during one or more days was small, and it has been assumed that the change was negligible for the half-hour interval between the magnetic and astronomical observations When the declination was observed with the compass of dip circle 205, the true south meridian was determined by sighting on the Sun, thus eliminating the use of a terrestrial mark.

In this connection it may be mentioned that the only extensive series of declinations observed under similar conditions is the one taken during the drift of the *Fram* across the Polar Sea during 1893 to 1896[1] On that Expedition the magnetic and astronomic observations were taken by the same observer When he used a terrestrial mark, he always determined the azimuth of the mark before or after the magnetic observation It is not probable that any serious errors are introduced by the movements of the ice in the inevitable time-intervals between the observations, but it is obviously of advantage, on the other hand, to take the observations simultaneously if two observers are available

[1] AKSEL S STEEN, Terrestrial Magnetism Scientific Results, Norwegian North Polar Expedition, 1893–1896, No VII

The circumstance that the ice in the vicinity of the ship might break at any time caused some inconvenience. It was inadvisable, therefore, to leave any instruments mounted on the ice, and after each observation they were always dismounted and taken on board the ship. Magnetometer 8 is packed disassembled in its ordinary instrument-case, but in 1922 the Department of Terrestrial Magnetism supplied the Expedition with a special case in which the completely assembled magnetometer could be carried, thus saving the observer the task of putting the instrument together and taking it apart before and after an observation No special carrying-case was needed for the dip circle, because this instrument is placed assembled in the ordinary instrument-case The carrying back and forth of the instruments, placing them in position, leveling, and adjusting them added to the time required for the observations and to the discomfort of the observers at low temperatures.

The other difficulties encountered were of the ordinary kind met with in the Arctic. The formation of frost on eyepieces and verniers was, as previously, very troublesome, but was now overcome by heating the ice-house or the tent with a Primus stove, all iron parts of which had been replaced by parts of copper or brass This heating in the coldest season did not bring the temperature in the ice-house or tent above $-15°$ to $-20°$ centigrade, but it made the air dry and kept the instruments entirely free from frost The stove was not used when observing declination with the magnetometer, because this observation took a short time and could be completed even at $-40°$ centigrade without great inconvenience to the observer and also because the special clamping and lifting fork (see Part I) greatly facilitated the manipulation of the magnet In summer all needles of dip circle 205 had to be carefully wiped and dried after each observation in order to prevent rusting, which, on account of the dampness of the air, was threatening to damage them. However, two of the needles (Nos 1 and 2) developed pivot-defects and had to be replaced by others

The behavior of the watches, which were subjected to great changes in temperature, was satisfactory and caused no trouble The rapidity of the temperature changes of the observer's watch was greatly diminished by carrying the watch in a small and tight wooden box provided with a glass window.

WORK AT WINTER-QUARTERS, 1924–1925

During the winter of 1924 to 1925 the *Maud* remained ice-bound 5 miles to the north of the small Four Pillar Island of the Bear Island group. The ice broke and the position of the ship changed several times in the fall, making the conditions in September and October 1924 similar to those in the drift-ice, but from October 20, 1924, to the end of June 1925 the ice remained so quiet that the conditions were practically the same as on solid ground. We were, however, so far from the coast that the danger of the ice breaking up always had to be considered, for which reason our arrangements for the magnetic observations were necessarily of a temporary character. In the middle of November a square tent 2 by 2 meters, previously used at Cape Chelyuskin from April to July 1919, was set up on the ice and used for absolute observations The photographic recording declinograph was mounted in a light-proof wooden box inside of one of the observing tents supplied by the Department of Terrestrial Magnetism The registrations were continued from November 1924 to May 1925, with several interruptions due to formation of frost and to difficulties in making the clock driving the drum run properly Before beginning the registrations, a few diurnal series of the declination were secured by eye-observations, a magnet-reading being taken every minute during 15 minutes of every hour.

REDUCTIONS TO STANDARD INSTRUMENTS

MAGNETIC STANDARDS ADOPTED

The International Magnetic Standards (designated I M S) as defined in Volume II of the "Researches of the Department of Terrestrial Magnetism," pages 211 to 278 (see also Vol IV, pp 395–475), have been adopted for the results contained in this report

The instruments used as standards by the Department, and with which the instruments of the Expedition were compared, are as follows In declination, C I W magnetometer 3 with correction on I M S of −0′1 to observed values, in horizontal intensity, C I W magnetometer 3 with zero correction on I M S to observed values, in inclination, earth inductor 48 made by Schulze with zero correction on I M S to observed values Magnetometer 8 and dip circle 205 were compared with these instruments in Washington by the method of simultaneous observations with exchange of stations in April 1918, in November and December 1921, and in November 1925 Field comparisons between magnetometer 8 and dip circle 205 were carried out by the same method in October 1924 and May 1925 Dip circle 154 was compared with earth inductor 48 in Washington in November and December 1921, but no comparison was undertaken in 1925, since this dip circle had not been used in the field during 1922 to 1925.

INSTRUMENTAL CONSTANTS, CORRECTIONS, AND COMPARISONS

Full details regarding the instrumental constants on which the computation of the results by magnetometer 8 contained in this report is based are given on pages 320 to 322

Corrections on I M S for C I W Magnetometer 8—The observed corrections on I M S for C I W magnetometer 8, with particulars as to the comparisons and the adopted corrections which have been applied to obtain the data given in the Table of Results, are shown in Table 8 The results of the comparisons in 1918 have also been entered in this table to show the agreement.

TABLE 8—*Adopted Corrections on I M S* [a] *for C I W Magnetometer 8, Corrections of February 18, 1926* (*Constants of May 1, 1918*)

Date	Station	Compared with	No sets D	No sets H	(I M S − C I W 8) D	Probable error	$\frac{\Delta H}{H}$	Probable error	Observers
					′	′			
Apr 24,25,26, 27, 1918	Washington, S_m and N_m	M 3 [b]	12	6	−0 7	±0 1	−0 00033	±0 00003	H W Fisk D M Wise
Nov 29,30, Dec 8,9,10, 1921	Washington, S_m and E_m	M 3 [b]	17	6	−0 7	±0 1	−0 00029	±0 00008	H W Fisk H R Grummann H U Sverdrup
Nov 10,11,12, 13,14,16,1925	Washington, S_m and N_m	M 3 [b]	13	6	−1 07	±0 1	−0 00035	±0 00007	H W Fisk H U Sverdrup
Values adopted, 1922 to 1925					−0 7		−0 00032		

[a] International Magnetic Standards as defined in Vol II, *Res Dep Terr Mag*, pp 270–273, the corrections are to be applied reckoning east declination and horizontal intensity as positive and west declination as negative

[b] (I M S − C I W 3) = −0′1 in D and 0 00000H in H, constants of December 12, 1910

It will be noted that the adopted value of the correction on I. M S for observed declinations deviates slightly from the mean correction resulting from the last two comparisons The value resulting from the first two comparisons has been retained, because the last comparison was obtained under disturbed conditions

The above corrections for observed declinations are those applying for complete determinations using magnet 8L The declination may be obtained also from the deflection-observations made in the determination of horizontal intensity, provided mark read-

ings are made before and after such observations This method was used once. The corrections on I M S for observed declinations with magnet 8S deflected by magnet 8L are noted as follows

For declinations determined from deflection-observations in connection with mark-readings, the collimating tube of the magnet 8S being kept at all times erect in its stirrup, the corrections are

For magnet 8L erect in its stirrup in deflection-box and magnet 8S erect in its stirrup suspended, for mean value from deflections east and west of suspended magnet, for all distances +1° 32′

For magnet 8L inverted in its stirrup in deflection-box and magnet 8S inverted in its stirrup suspended, for mean value from deflections east and west of suspended magnet, for all distances . +0° 07′

These corrections apply with an accuracy of 1 minute to reduce values deduced from deflections only on the east or only on the west for any deflection distance from 25 to 40 cm

Corrections on I M S for C I W Dover dip circle 205

(*a*) *The correction for observed declination by compass-attachment* after the sights of the compass were modified in February 1922 was found to be from observations in February 1922 at Washington subsequent to modifications (I M S − dip-circle compass 205) = +3′

At Deering, Alaska, the declination was observed July 9 and 12, 1922, both with magnetometer 8 and compass of dip circle 205 Two observations were taken with both instruments in such a manner that the mean time of the observations agreed From these observations, after reducing the declinations observed by magnetometer 8 to I M S[2] we find, July 9, 1922 (I M S − dip-circle compass 205) = −5′4, July 12, 1922 (I M S − dip-circle compass 205) = −10′6, mean −8′0

On October 3, 1924, a complete intercomparison between magnetometer 8[2] and dip-circle compass 205, comprising twelve sets with each instrument and exchange of stations, was carried out, this comparison gave (I M S − dip-circle compass 205) = −9′3 No determination of the correction was made after the return to Washington in 1925

The dip-circle compass 205 was used for determining the declination during brief intervals in the summers of 1923 and 1924 Considering that the comparisons in July 1922, and on October 3, 1924, were carried out in the region where the observations with dip-circle compass 205 were taken and giving the latter greater weight, we adopt for all field observations (I M S − dip-circle compass) = −9′

(*b*) *Corrections for observed inclinations* as determined at Washington are shown in Table 9

TABLE 9—*Corrections on I M. S in Inclination for C I W Dover Dip Circle 205 Determined at Washington*

Date	Station	Compared with	No sets	(I M S − C I W 205) for needle 1	2	3_{223}	6	3	7	Observers
				′	′	′	′	′	′	
Nov 26, 28, 30, Dec 1, 3, 5, 6, 7, 1921	Washington, S_e and E_m	EI 48 [a]	12	−0 2	+0 1		−0 2	−0 2	−1 5	H W Fisk, H U Sverdrup
Nov 19, 20, 21, 24, 1925	Washington, S_m and N_m	EI 48 [a]	6			+0 4	+0 8	−5 3	−1 7	H W Fisk, H U Sverdrup

[a] (I M S − C I W 48) = 0′0

Needles 1 and 2 developed pivot defects during the field work and had to be rejected

To determine whether there was any material change in corrections at field stations, the differences of various determinations by the several needles at field stations were

[2] (I M S − C I W 8) = −0′7

tabulated. The mean differences were formed for two periods, the first from August 1922 to December 1923, inclusive, being the period in which needle 1 was still used, and the second period from January 1924 to May 1925, inclusive The following values were found

August 1922 to December 1923

$(1-2) = +0'4$, 138 values, $(1-3_{223}) = +0'5$, 7 values
$(1-6) =$ 0 0, 7 values, $(1-3) = +0\ 2$, 138 values
$(1-7) = -1\ 5$, 7 values

January 1924 to May 1925

$(6-2) = +0'3$, 55 values; $(6-3_{223}) = -0'6$, 21 values
$(6-3) = -1\ 2$, 74 values, $(6-7) = -1\ 4$, 3 values

A closer inspection of the differences here tabulated shows that for short time-intervals they run irregularly, except the difference $(6-3)$, for which we find after January 1924 the following:

Difference	Jan and Feb 1924	Mar and Apr 1924	May to July 1924	Oct to Dec 1924	Jan to May 1925
(6−3)	−0′1	−0′9	−0′8	−2′4	−1′6

Considering the small values and the various signs of the corrections to dip needles 1, 2, 3_{223}, and 6 before departure and after return, and, furthermore, the uncertainty regarding the conditions in the field which appears in the variation of the differences between the needles, it seems justifiable to apply *no corrections* on I M S to the inclinations observed with needles 1, 2, 3_{223}, and 6 To inclinations observed with deflected needle 3 no correction on I. M S. is to be applied until the end of February 1924, but a correction of $-1'0$ is to be applied from March to July 1924 and of $-2'0$ from October 1924 to May 1925 To inclinations observed with deflected needle 7 a correction on I. M. S of $-1'5$ is to be applied during the whole period The adopted corrections are shown in Table 10.

TABLE 10—*Adopted Corrections on I M S in Inclination for C I W Dip Circle 205 for August 1922 to May 1925*

Period	(I M S − C I W 205) for needle No					
	1	2	3_{223}	6	3	7
	′	′	′	′	′	′
Aug 1922 to Feb 1924	0 0	0 0	0 0	0 0	0 0	−1 5
Mar 1924 to July 1924	0 0	0 0	0 0	0 0	−1 0	−1 5
Oct 1924 to May 1925	0 0	0 0	0 0	0 0	−2 0	−1 5

Intensity-constants for C I W Dover dip circle 205—The intensity-constants based on I M S for dip-circle 205 were determined in Washington for intensity-needles 3 and 4 and 7 and 8 in 1921 and again in 1925

Observations in the field were taken with needles 3 and 4 at all stations, for which reason the constants of these needles are most important Pair 7 and 8 were occasionally used together with 3 and 4 The constants of the needles can be computed from field observations in cases where the intensity has been observed simultaneously with magnetometer 8 The various determinations are summarized in Table 11.

The values of the constants determined for needle-pair 3 and 4 in Washington and computed from field observations are compiled above. At four field stations the stations

were not exchanged, for which reason it is necessary to assume that the station-differences here are negligible. The values derived on this assumption are placed in parentheses. The last two comparisons in the field were carried out under favorable circumstances, all necessary precautions having been taken, and, therefore, can be given great weight

TABLE 11—*Summary of Intensity-Constant Determinations on Basis of I M S for C I W Dover Dip Circle 205*

Date	Station	Compared with	No sets	Logarithm of combined constant C for total-intensity needles		Observers
				3 and 4	7 and 8	
Nov 26, 28, Dec 1, 2, 7, 1921	Washington, S_e and E_m	M 3 and EI 48	6	9 57626	9 57735	H W Fisk and H U Sverdrup
Oct 27, 1922	81	M 8	1	(9 57865)		H U Sverdrup and O Wisting
Nov 11, 1922	88	M 8	1	(9 57671)		H U Sverdrup and O Wisting
May 25, 1923	191	M 8	1	(9 57737)		H U Sverdrup and O Wisting
Oct 5, 1923	250	M 8	1	(9 57748)	(9 57780)	H U Sverdrup and O Wisting
Oct 14, 15, 1924	360 and 360*c*	M 8	6	9 57822		H U Sverdrup and O Wisting
May 14, 1925	360*e* and 360*d*	M 8	2	9 57853		H U Sverdrup and O Wisting
Nov 19, 20, 21, 24, 1925	Washington, S_m and N_m	M 3 and EI 48	6	9 57769	9 57875	H W Fisk and H U Sverdrup

These comparisons show a great increase over the determination of the constant in 1921, and a steady increase, furthermore, is indicated by the results of the other field comparisons, except the very first one The second determination of the constant in Washington at the end of November 1925 also shows an increase since November 1921, but gives a smaller value than the last two field determinations The instrument, however, had been subjected to rough handling during transportation from Seattle to Washington in October 1925, the glass of the magnet-house having been broken, and for this reason it appears inadvisable to use the results of the last determination for the reduction of the field observations A very small displacement of the support of the agate bearings, or of the vertical circle, would account for the change in the constant which apparently took place between May 14 and November 20, 1925

In view of these circumstances, the adopted constant will be based on the determinations at Washington in November 1921 and the field determinations in October 1924 and May 1925 Assuming that the observed change has been gradual, we shall adopt, where t is the epoch of observation

Needles 3 and 4 on basis I. M S $\log C = 9\ 57630 + 0\ 000673\ (t - 1922\ 0)$

Needle-pair 7 and 8 was only compared once in the field, without exchange of stations, the pair was practically not used The determinations in Washington show a similar increase of the constant as for needle-pair 3 and 4, indicating that the two pairs have changed materially in the same way. We, therefore, shall adopt values corresponding to those adopted for needle-pair 3 and 4, namely

Needles 7 and 8 on basis I M S $\log C = 9\ 57739 + 0\ 000673\ (t - 1922\ 0)$

Both loaded dip and deflections were observed at all stations, for which reason the values of the loaded-dip constant and the deflection constant, which are subject to changes because of variations in magnetic moment, are not required for the computations.

Regarding formulæ for intensity-computations and differential formulæ for applying corrections on computed values of total and horizontal intensity for changes in the intensity-constant and in inclination, see page 324.

MAGNETIC OBSERVATIONS, 1922–1925

EXPLANATORY REMARKS

Precisely the same conventions have been followed in the presentation of the field results obtained during the four years, 1918 to 1921, as adopted in Volumes I, II, and IV of the *Researches* of the Department of Terrestrial Magnetism. These conventions, briefly recapitulated, are as given in the following paragraphs.

It has not been deemed advisable to attempt at present to apply corrections to the observed results on account of the numerous variations of the Earth's magnetism, *e g.*, diurnal variation, secular variation, magnetic perturbations, etc. Instead, it is believed to be better to publish the observed results as obtained, with no corrections applied, except the reductions to the magnetic standards of the Department, as fully explained on page 319 The reduction to a common epoch can be undertaken more advantageously later It will be noticed, however, that opposite the magnetic elements appearing in the Table of Results the date and local mean time of each observation are given, thus supplying the required information for reducing the observed values to some mean period The tabular entries are in the order of decreasing north latitude If several stations lie in the same latitude, they have been arranged in order of decreasing east longitude

The question whether to give values of horizontal intensity exclusively or values of total intensity was decided in favor of the former The horizontal-intensity values indicated in italics are derived from the observed total-intensity values and the observed inclinations.

The intensities are published in C. G. S. units. The fourth decimal may be frequently uncertain by one or more units It will be noted that the values are given to the fifth decimal, but it should be understood that no claim is made as to the correctness of the last figure, this figure is retained primarily in order that when all reductions to epoch have been applied on account of the magnetic variations an error of a unit in the fourth decimal, due purely to computation, will not enter

The headings for the columns of the Table of Results are self-explanatory. The following abbreviations have been adopted for the months of the year· Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec. For stations near the meridian 180° east of Greenwich the dates are reckoned from that meridian without regard to the International date line. Local mean times are expressed to the nearest 0 1 of an hour of each value, and are given according to civil reckoning, being counted from midnight as zero hour continuously through 24 hours; 16^h, for example, means 4 o'clock p. m. The declination and inclination values are, in general, given in degrees, minutes, and tenths of minute of arc. The values of declination resulting from compass-observations are given to the nearest minute only, as the results can not be considered of greater precision than the nearest minute. The instruments are designated in the instrument columns as follows Under "Mag'r," 8 for magnetometer 8, and *205* for compass-attachment of dip circle 205, under "Dip Circle," 205, with numbers following to indicate the numbers of needles used for dip circle 205 [needle No 7 of circle 178 is indicated by being inclosed in parentheses, thus, 205 56(7)]

MAGNETIC DISTURBANCES

In a few cases, observations of declination were discontinued because violent magnetic disturbances made readings impossible For the sake of record, the locations, dates, and times when this happened are entered in Table 12

It may be added that observations with dip circle 205 also were discontinued several times on account of disturbances, but these cases have not been compiled, because it is not possible to decide whether the disturbances were of a magnetic or mechanical character.

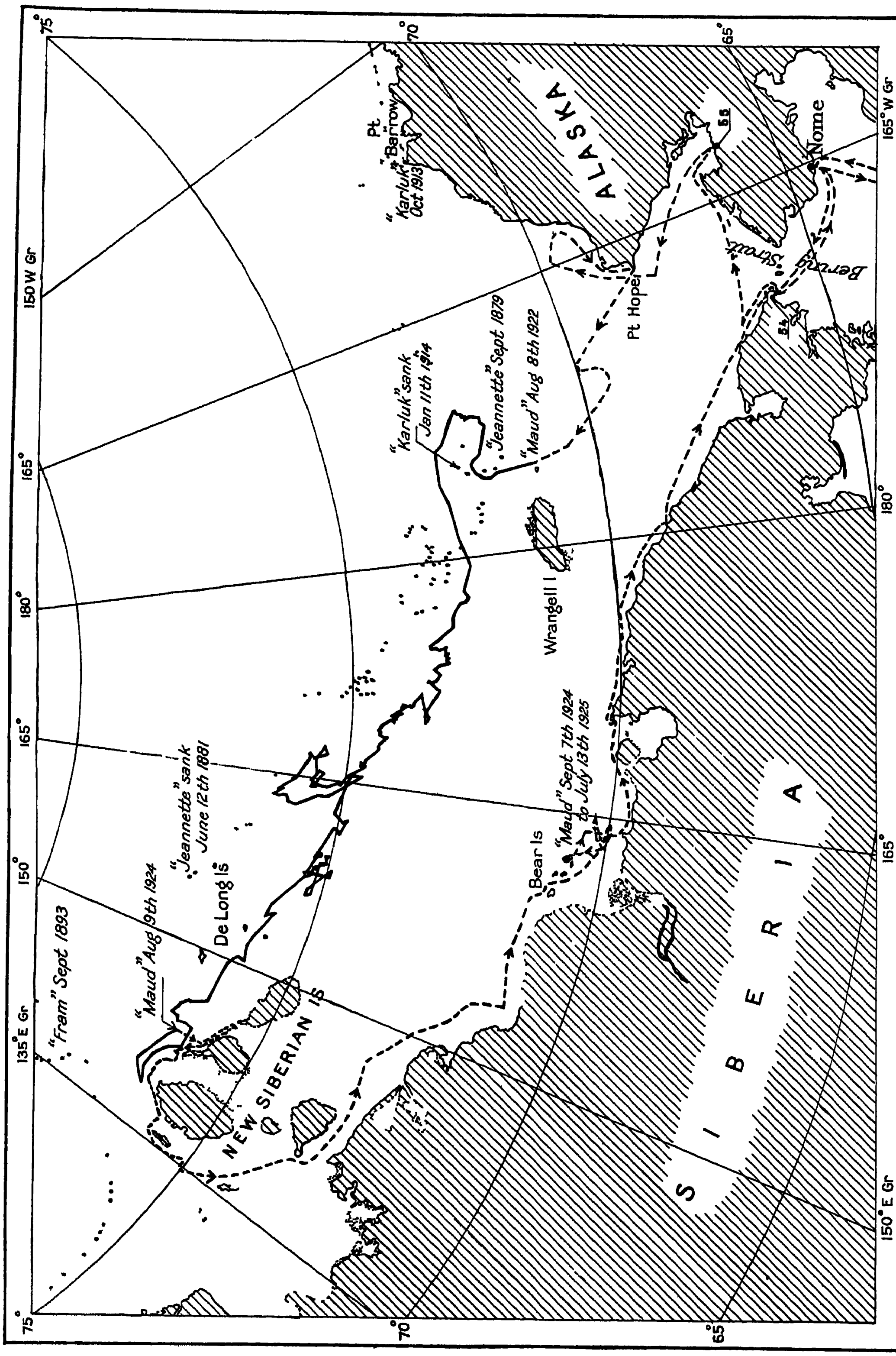


FIG 7—Map showing drifts of the *Maud*, 1922–24, of the *Karluk*, 1913–14, of the *Jeannette*, 1879–81, and part of the drift of the *Fram*

OBSERVERS

In the last column of the Table of Results the observer responsible for the observations is indicated by his initials When the observations were made by two or more observers, the fact is shown by combination of their last initials. The declination observations with magnetometer 8 were generally taken by F. Malmgren, assistant scientist, the inclination and total-intensity observations with dip circle 205 by Captain O Wisting, and the horizontal-intensity observations with magnetometer 8 by the writer, who also took some of the other magnetic observations and all of the astronomic observations When eye-observations for diurnal variation were taken at winter-quarters in October and November 1924, all members of the Expedition participated

TABLE 12—*Observations of Declination Discontinued on Account of Magnetic Disturbance*

Lat north		Long east		Date	L M T	
°	′	°	′		h	m
72	48	177	36	Oct 17, 1922	23	16
74	26	167	52	Apr 21, 1923	7	40
75	38	166	40	Aug 4, 1923	17	20
75	13	159	02	Dec 10, 1923	9	05
75	18	156	28	Jan 23, 1924	15	22
75	19	156	22	Jan 24, 1924	14	53

All original computations were carried out in the field by the writer, who also has made the final revisions, with some assistance from H. W. Fisk, of the Department of Terrestrial Magnetism

DISTRIBUTION AND GEOGRAPHIC POSITIONS OF STATIONS

Figure 7 shows the route of the *Maud* to and from the drift-ice, the route of the drift, the position of the two land stations occupied before entering the drift-ice in 1922, and the location of the winter-quarters of the *Maud* during 1924 to 1925 Figures 8, 9, and 10 show the positions of the stations occupied when drifting with the ice-fields It may be noted that the numbers of the stations begin with 54, continuing the series of numbers from the period 1918 to 1921 A few numbers occur twice, partly because they refer to simultaneous observations at stations only a few meters apart and partly on account of mistakes in the original records A few numbers are lacking, because the observations at these stations were incomplete and have been rejected.

Observations taken on the same days have been entered as taken at the same station, though the distance between the actual places of observation, because of exceptionally rapid drift, may be as great as two or three miles The distance is, however, generally less than one mile and, since a reliable estimate of this distance is difficult, no attempt to take it into account has been made.

In the drift-ice all astronomical observations were taken by theodolite, and the corrections and rates of the chronometers were checked by wireless time-signals The observed latitudes and longitudes, therefore, are generally correct within 0′2 and 0′5, respectively In summer the accuracy is somewhat smaller, partly because a smaller theodolite was used and partly because the melting of the ice made leveling difficult Furthermore, the positions in summer had to be determined by observing the Sun Between the two necessary observations a time-interval of three to six hours elapsed, and the correction for estimated drift in this time, to be applied to the result of the first observation, was sometimes uncertain.

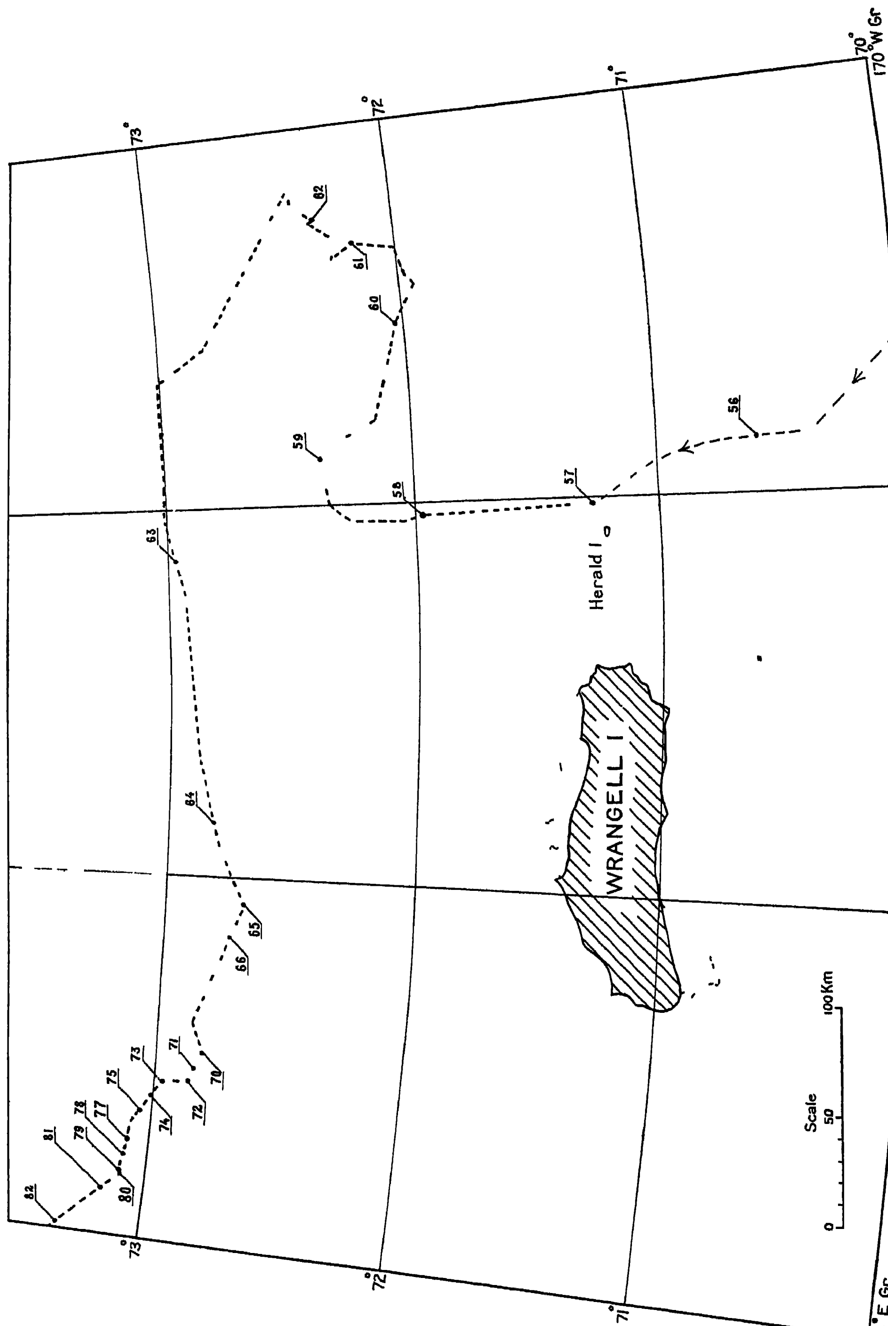


FIG 8—Distribution of the *Maud's* stations 56–82

The observations of the magnetic declination were taken simultaneously with the astronomical observations and, therefore, can be referred to an accurately known position. This, however, does not apply to the inclination and intensity observations, which occasionally were taken on the same day as the astronomical observations, but at another time and occasionally on days when no observations for position could be obtained. In the latter case the position of the magnetic station was determined by linear interpolation between the two nearest observed positions. Considering the uncertainty of this interpolation, due to the irregularities of the drift, and, furthermore, the lack of simultaneity between magnetic and astronomical observations taken on the same day, the positions of all magnetic stations in the Table of Results are given to the nearest minute of latitude and longitude only. On days with astronomical observations they will generally be correct within one minute of latitude, corresponding to three minutes of longitude, but the errors of the interpolated positions may be larger and may amount in exceptional cases to five and fifteen minutes, respectively.

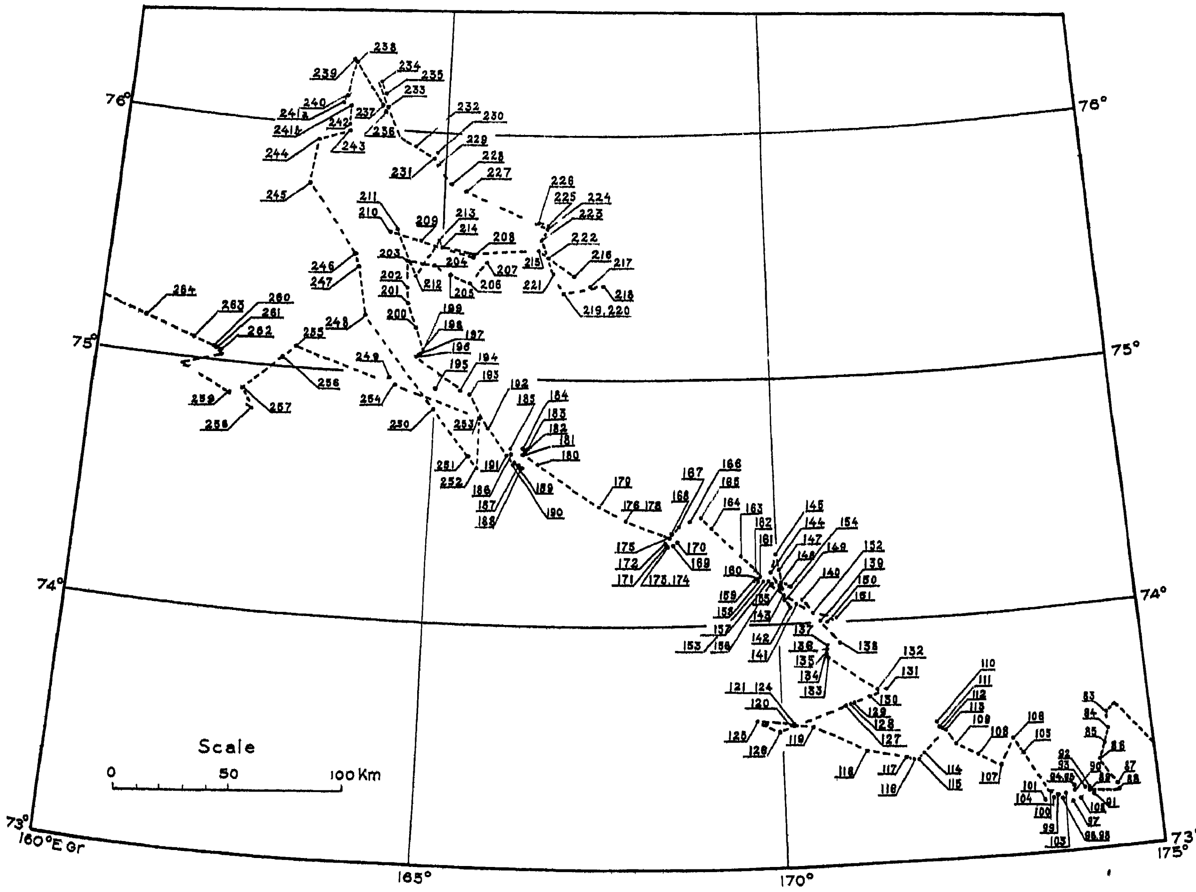


FIG 9—Distribution of the *Maud's* stations 83-264

It seems possible to interpolate with a higher degree of accuracy by taking into account the influence of the wind during the time-interval between two astronomical observations. There exists a marked relation between the direction and velocity of the wind and the direction and velocity of the drift. The most reliable way of interpolating, therefore, might be to compute the drift for the time-interval between the preceding astronomical observation and the magnetic observation by means of the resulting wind-vector in

this time-interval, assuming that the relation between wind and drift was the same in this interval as in the whole time between the preceding and the following astronomic position This relation can be found by comparing the resultant wind-vector in the time between the astronomical observations with the drift which can be derived from the observed positions

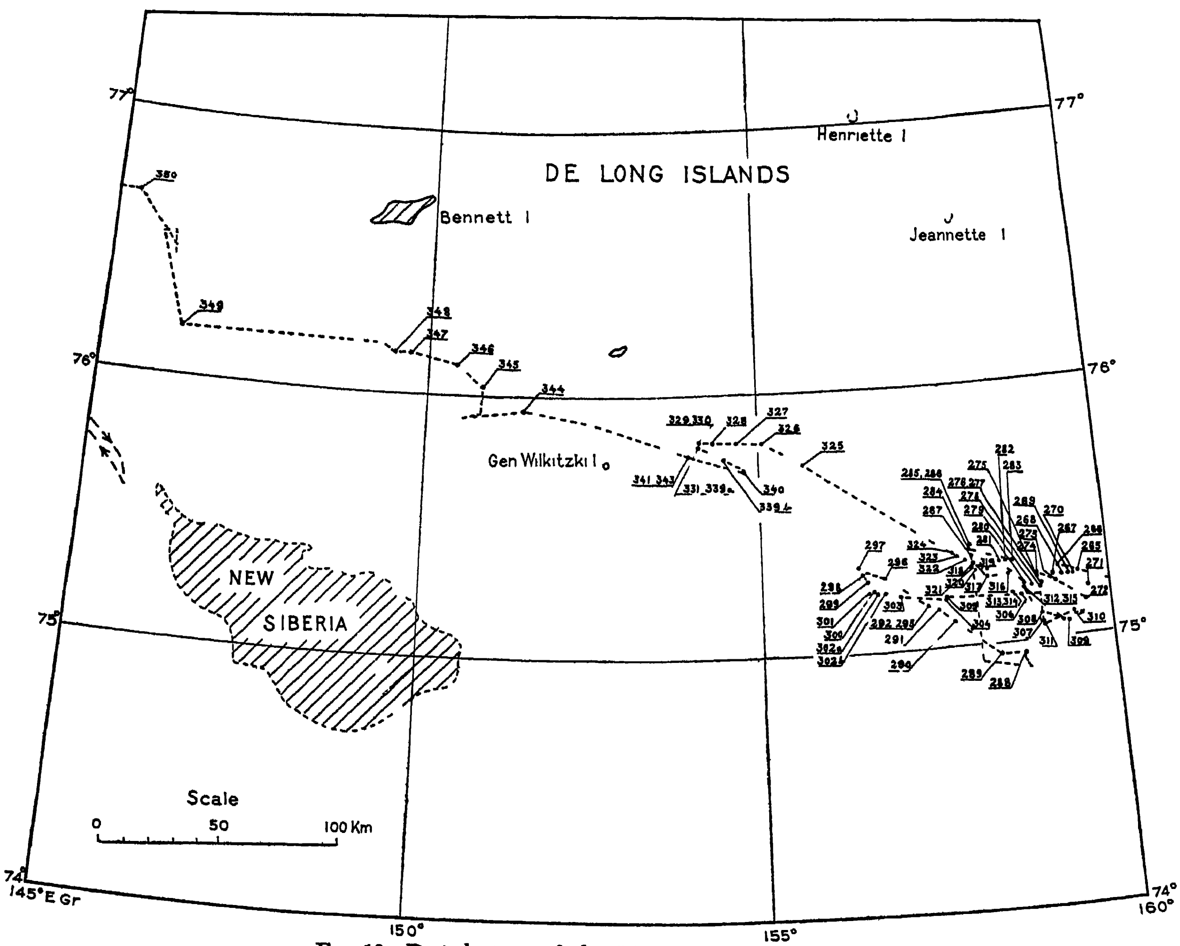


FIG 10—Distribution of the *Maud's* stations 265-350

A study of the relation between wind and drift is to be undertaken later, and opportunity may then be taken to compute the drift of the *Maud* as accurately as possible by deriving the position at noon every day by means of the method outlined above The positions determined by linear interpolation will probably deviate more or less from those derived from considerations involving the wind, but it is expected that the discrepancy generally will be less than two minutes in latitude and six minutes in longitude and only exceptionally amount to five minutes and fifteen minutes, respectively The study of the relation between wind and drift, however, will take a long time, and the results will not be of great importance to the results of the magnetic observations These are so numerous that the accidental errors arising from the linear interpolation can be eliminated by forming group means, and an uncertainty of one or two minutes in the single positions is of no consequence Therefore, in this report it has been decided to publish as the positions of stations the positions observed or determined by linear interpolation on the same day, but at different times, although these may be modified eventually for these

days in later reports published after the compilations of wind effects have been made and applied

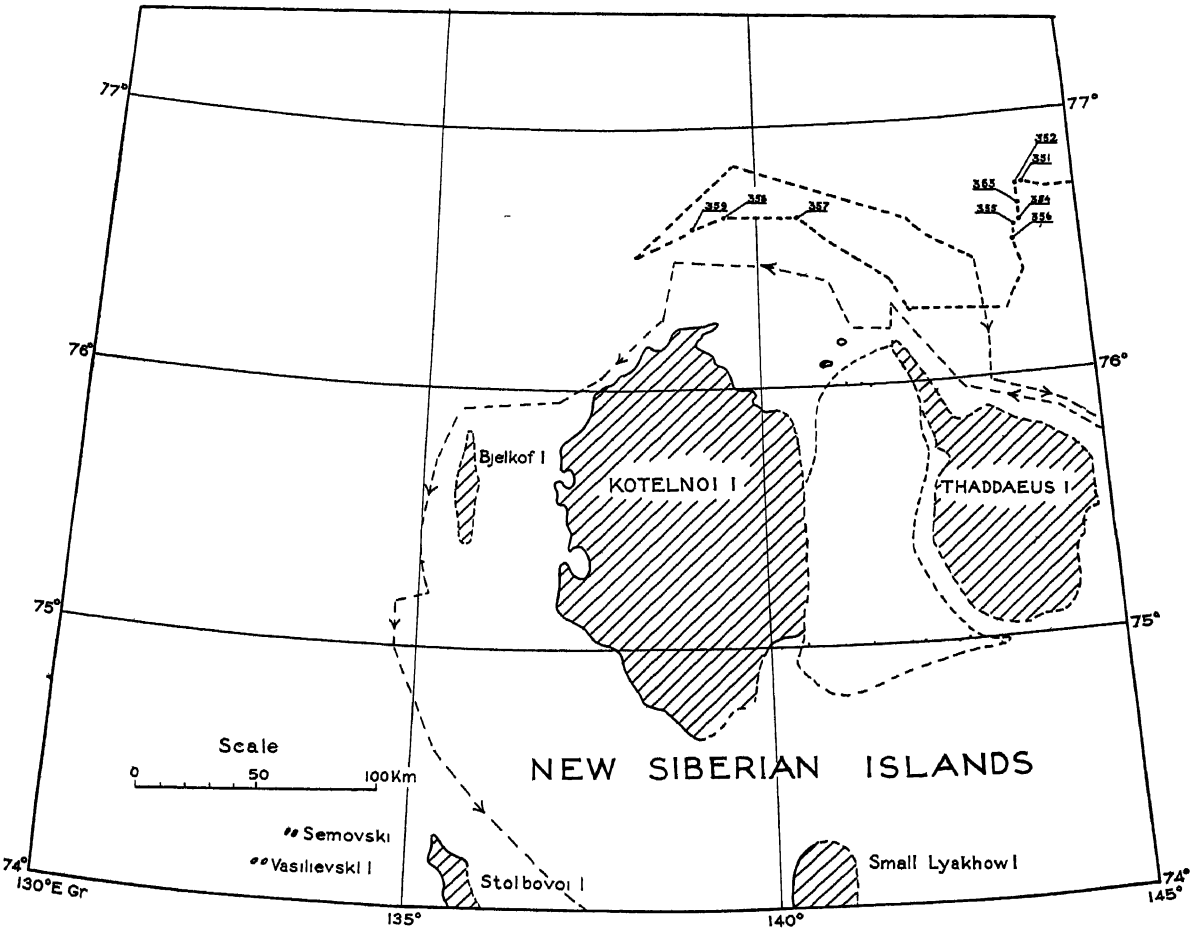


FIG 11—Distribution of the *Maud's* stations 351-359

The positions of land stations Nos 54 and 55, as well as station No 360 (winter-quarters of 1924 to 1925) are accurately determined It will be noted that the distances between stations Nos 360, 360*a*, 360*b*, 360*c*, and stations Nos 360*d*, 360*e*, 360*f*, are small (see Fig. 12), the three stations of each group are close to each other, some being auxiliary stations used for intercomparison of instruments

The results of the magnetic observations obtained during 1922 to 1925 are given in the Table of Results (see pp. 356–364).

ISOMAGNETIC CHARTS

All results contained in this and Part I, except those from the region around Cape Chelyuskin, have been entered on charts and the isomagnetic lines for the declination, the horizontal intensity, and the inclination have been drawn, utilizing other sources whenever available.

The isogonics for the epoch 1925 0 are represented in Figure 13. It will be noted that the lines are full-drawn along a strip a few hundred miles from the coast and that they also are full-drawn over Alaska and part of the Siberian coast In these regions

the lines are based on the actual observations Where the lines are interpolated or extrapolated they are dashed The isogonics over Alaska have been taken from the chart of the variation of the compass for 1925 by the United States Hydrographic Office West of Bering Strait the isogonics are based mainly upon the results of the *Maud* Expedition, but in addition several Russian observations have been used, mainly in the region west of the 165th degree of longitude, east of Greenwich

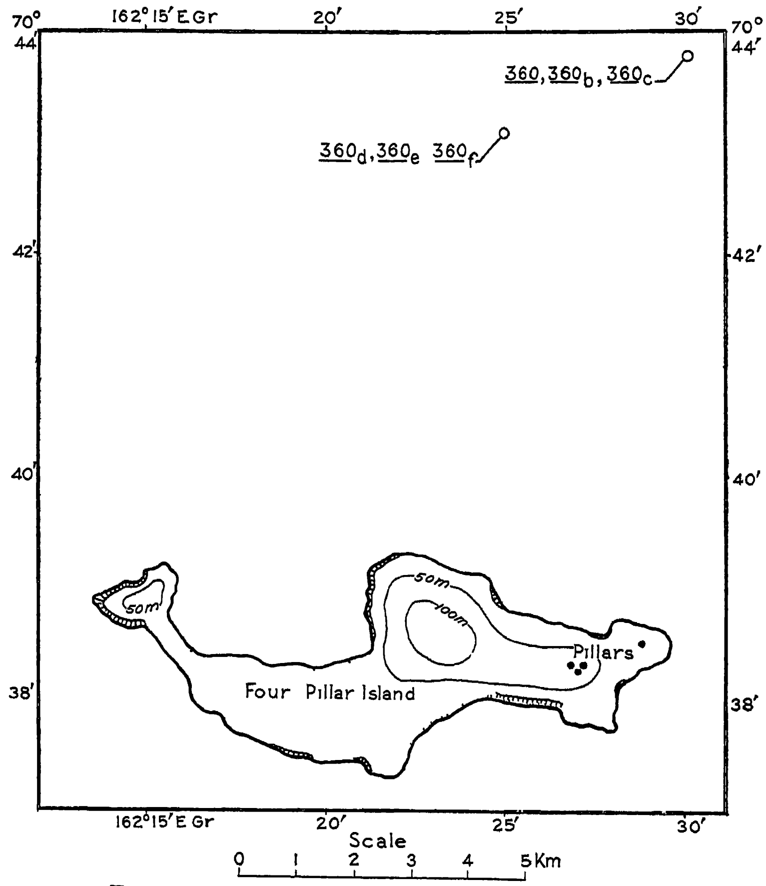


FIG 12—Distribution of the *Maud's* stations 360–360*f* near Four Pillar Island

These Russian observations are entered on the latest charts of the Siberian coast issued by the Russian Hydrographic Office and, according to statements on these charts, are reduced to epoch 1911 0 The values which have been used when drawing the isogonics in Figure 13 are contained in Table 13 The geographic positions of the stations have been taken from the Russian charts On these charts the information is entered that the secular change of the declination in the region of the New Siberian Islands is $-6'$ to $-8'$ per year At the station Pitlekai, the secular change between 1879 and 1921 was found to be $-6'6$ per year (see p 339) According to this, the secular change in the entire region west of Bering Strait has been assumed to be $-6'$ per year A correction of $-6'$ a year, therefore, has been applied to all values, both to the Russian values, which are referred to epoch 1911 0 and to the results from observations of the *Maud* Expedition between the years 1920 to 1925 The adopted value of the secular variation, $-6'$ per year, appears to be fairly correct Five of the Russian stations in Table 13, Nos 4, 5, 6, 7, and 12, are not far from stations of the *Maud* Expedition and the reduced

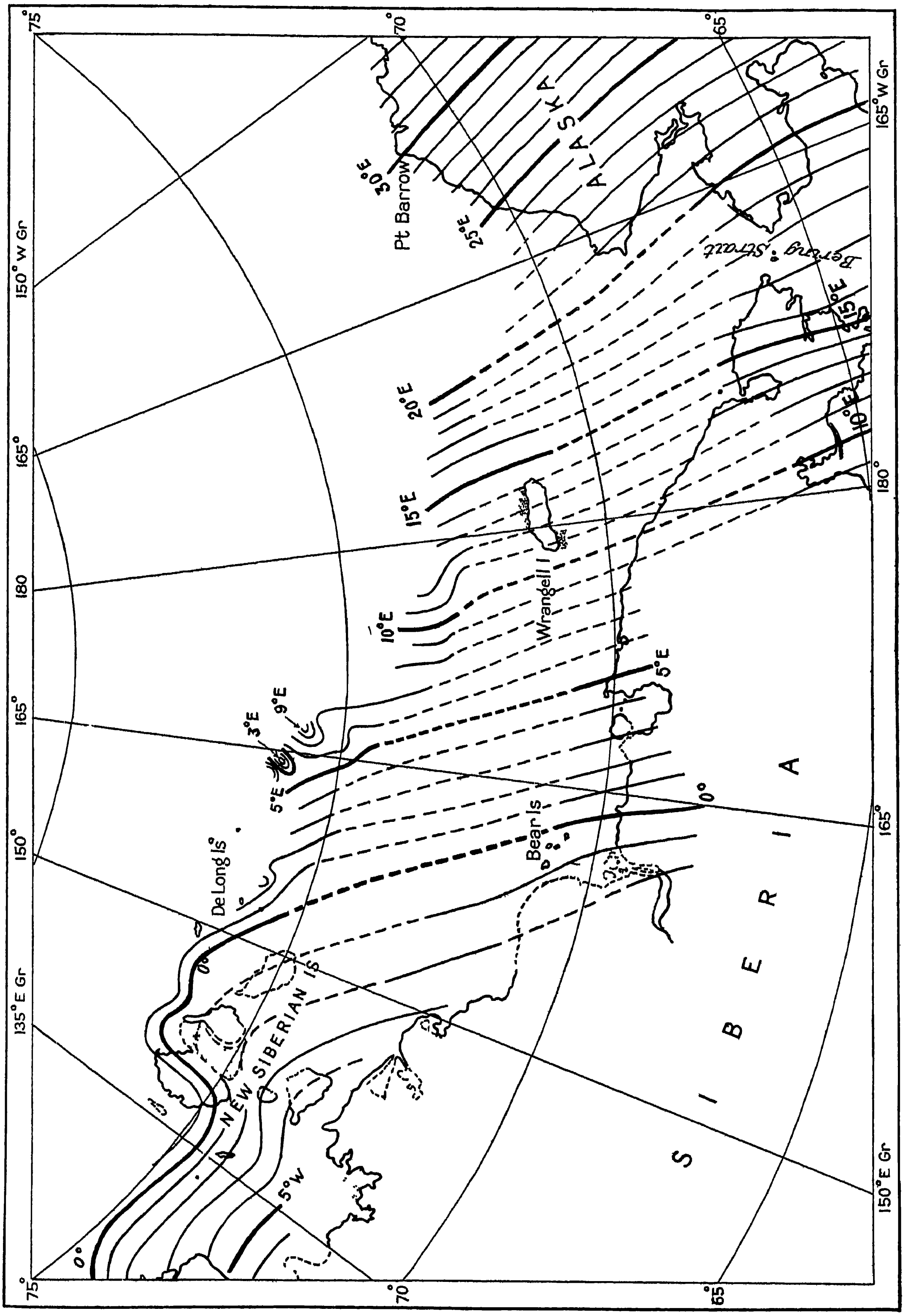


FIG 13—Lines of equal magnetic declination, Arctic Sea off north coast of Siberia, epoch 1925 0

RESULTS OF MAGNETIC OBSERVATIONS, MAUD EXPEDITION, 1922-1925

ARCTIC REGION

ARCTIC SEA

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 351	76 44 N	144 09	Jun 25, '24	16 8,17 3	1 30 E	10 6	84 32 3 N	10 6	05557	205	205 236	S&W
			Jun 25, 24	18 0	1 29 9 E					8		FM
No 352	76 43 N	144 06	Jun 26, 24	17 0	1 09 1 E					8		FM
No 350	76 41 N	145 08	Jun 23, 24	10 8	0 17 E					205		HUS
No 358	76 39 N	139 28	Jul 25, 24	9 4,11 2	1 16 E	10 5	84 44 3 N	10 5	05376	205	205 236	HUS
No 353	76 39 N	144 06	Jun 27, 24			10 2	84 28 9 N	10 2	05619	205	205 236	OW
No 357	76 38 N	140 38	Jul 21, 24	14 7,16 7	0 16 E	15 7	84 29 8 N	15 7	05626	205	205 236	HUS
No 359	76 36 N	139 00	Jul 30, 24	9 6,11 6,15 3	1 07 E	10 5	84 44 3 N	10 5	05384	205	205 236	S&W
No 355	76 34 N	144 00	Jun 30, 24			10 1	84 25 8 N	10 0	05668	205	205 236	OW
No 354	76 34 N	144 01	Jun 28, 24	17 4	1 26 4 E					8		FM
No 356	76 30 N	143 58	Jul 2, 24	17 1	1 04 7 E					8		FM
No 239	76 17 N	163 28	Sep 7, 23			9 9	83 36 5 N	9 8	06453	205	205 123	OW
No 238	76 16 N	163 28	Sep 6, 23	17 1	5 59 4 E					8		FM
No 234	76 12 N	163 58	Aug 30, 23			15 2	83 27 0 N	9 8,11 0	06564	8	205 123	S&W
			Aug 30, 23			16 7	83 28 1 N	15 2	06612	205	205 67(3)	OW
			Aug 30, 23					16 7	06602	205		OW
No 349	76 11 N	146 11	Jun 10, 24			10 4	84 07 0 N	10 4	05999	205	205 2367(3)	OW
No 348	76 09 N	149 30	Jun 5, 24			10 1	83 47 7 N	10 1	06337	205	205 236	OW
No 347	76 09 N	149 45	Jun 4, 24	17 6	0 17 E					205		FM
No 235	76 09 N	164 00	Aug 31, 23	16 7	3 34 4 E					8		FM
No 240	76 08 N	163 22	Sep 11, 23			10 0	83 43 0 N	10 0	06481	205	205 123	OW
			Sep 11, 23	17 2	7 23 1 E					8		FM
No 233	76 07 N	164 05	Aug 27, 23			10 8	83 23 0 N	10 8	06696	205	205 123	OW
No 346	76 06 N	150 26	Jun 3, 24	16 3	0 31 E	10 1	83 45 6 N	10 1	06350	205	205 236	S&W
			Jun 3, 24	17 6	0 40 9 E					8		FM
No 241*a*	76 06 N	163 19	Sep 12, 23	9 8	7 21 3 E					8		FM
No 241*b*	76 05 N	163 27	Sep 12, 23	17 1	5 52 7 E					8		FM
No 237	76 04 N	163 50	Sep 3, 23			10 2	83 13 0 N	10 2	06867	205	205 123	OW
No 236	76 04 N	164 02	Sep 1, 23	9 1	2 21 9 E					8		FM
			Sep 1, 23			10 3	83 16 2 N	10 3	06816	205	205 123	OW
No 345	76 02 N	150 49	Jun 2, 24	16 2	0 36 E					205		FM
No 242	76 01 N	163 26	Sep 14, 23			10 0	82 34 7 N	10 0	07629	205	205 12	OW
No 243	76 00 N	163 26	Sep 15, 23	9 8	4 48 9 E					8		FM
No 244	75 56 N	162 59	Sep 17, 23	9 0	5 19 6 E					8		FM
			Sep 17, 23			10 6	82 46 9 N	10 5	07325	205	205 123	OW
No 232	75 56 N	164 32	Aug 24, 23			10 1	83 01 0 N	10 1	07053	205	205 123	OW
No 230	75 55 N	164 51	Aug 21, 23	16 9	6 06 5 E					8		FM
No 344	75 54 N	152 27	May 19, 24	10 0	0 36 E					205		HUS
No 231	75 54 N	164 49	Aug 23, 23	17 1	6 12 6 E					8		FM
No 229	75 52 N	164 52	Aug 20, 23			10 2	82 57 3 N	10 2	07118	205	205 123	OW
			Aug 20, 23	16 9	6 22 4 E					8		FM
No 329	75 49 N	154 04	Apr 11, 24	16 7	3 04 7 E					8		FM
No 330	75 49 N	154 06	Apr 14, 24			10 0	83 41 8 N	10 0	06441	205	205 236	OW
			Apr 14, 24	16 8	3 41 9 E					8		FM
No 328	75 49 N	154 16	Apr 10 24			10 5	83 47 7 N	10 5	06311	205	205 236	OW
No 335	75 48 N	154 01	Apr 23, 24	17 3	3 36 1 E					8		FM
No 336	75 48 N	154 02	Apr 24, 24			10 9	83 29 0 N	10 9	06651	205	205 236	OW
			Apr 24, 24			10 9	83 27 3 N	10 9	06683	205	205 17(3)	OW
No 333	75 48 N	154 03	Apr 18, 24	16 6	3 40 9 E					8		FM
No 337	75 48 N	154 03	Apr 25, 24	17 8	3 51 8 E			15 7,17 0	06779	8		S&M
No 339*a*	75 48 N	154 04	Apr 30, 24	17 9	3 45 8 E					8		FM
No 332	75 48 N	154 05	Apr 17, 24			10 5	83 27 9 N	10 6	06656	205	205 236	OW
No 331	75 48 N	154 07	Apr 16, 24	17 6	3 33 9 E					8		FM
No 334	75 48 N	154 07	Apr 21, 24			11 3	83 31 7 N	11 3	06616	205	205 236	OW
			Apr 21, 24	17 0	3 04 7 E					8		FM
No 338	75 48 N	154 08	Apr 28, 24			10 1	83 29 1 N	10 1	06667	205	205 236	OW
			Apr 28, 24	17 0	3 39 0 E					8		FM
No 327	75 48 N	154 42	Apr 9, 24	16 7	2 30 7 E					8		FM
No 326	75 48 N	155 02	Apr 8, 24	16 2	1 52 4 E					8		FM
No 228	75 47 N	165 04	Aug 15, 23	18 0	6 00 3 E					8		FM
No 343	75 46 N	153 53	May 15, 24	16 1	2 28 6 E					8		FM
No 341	75 46 N	153 54	May 12, 24	16 7	2 22 0 E					205		HUS
No 342	75 46 N	153 54	May 14, 24			10 2	83 39 5 N	10 2	06453	205	205*236	OW
No 245	75 46 N	162 54	Sep 21, 23	9 0	5 17 0 E					8		FM
			Sep 21, 23			10 3	82 44 0 N	10 3	07372	205	205 123	OW
No 227	75 46 N	165 18	Aug 14, 23			10 2	82 55 7 N	10 2	07141	205	205 123	OW
No 325	75 43 N	155 38	Apr 7, 24			9 8	83 05 8 N	9 8	07052	205	205 236	OW
			Apr 7, 24	16 2	2 21 1 E					8		FM
No 340	75 42 N	154 44	May 5, 24			14 8	82 56 3 N	14 8	07236	205	205 236	OW
No 226	75 38 N	166 29	Aug 6, 23			10 9	82 47 2 N	10 9	07269	205	205 123	OW
			Aug 6, 23	16 9	8 58 8 E					8		FM
No 225	75 38 N	166 38	Aug 3, 23			10 3	82 49 6 N	10 3	07232	205	205 123	OW
No 224	75 36 N	166 37	Aug 2, 23	17 6	9 20 8 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 211	75 35 N	164 18	Jul 7, '23	9 7	5 53 4 E					8		FM
No 210	75 34 N	164 12	Jul 6, 23	17 9	5 33 E	10 2	82 42 9 N	10 2	07387	205	205 123	W&M
No 223	75 34 N	166 33	Aug 1, 23	17 9	8 40 3 E					8		FM
No 213	75 33 N	164 57	Jul 12, 23	17 1	5 57 6 E					8		FM
No 214	75 32 N	165 00	Jul 13, 23	18 1	6 39 E	11 2	82 43 4 N	11 1	07323	205	205 123	W&M
No 209	75 31 N	164 45	Jul 3, 23			10 4	82 40 9 N	10 4	07386	205	205 123	OW
			Jul 3, 23					15 6,16 9	07409	8		HUS
No 215	75 31 N	166 31	Jul 17, 23			10 4	82 47 4 N	10 4	07306	205	205 123	HUS
No 222	75 30 N	166 39	Jul 31, 23			11 1	82 45 3 N	11 1	07329	205	205 123	OW
			Jul 31, 23			11 1	82 45 2 N	11 1	07325	205	205 67(3)	OW
No 246	75 29 N	163 40	Sep 24, 23			10 2	82 41 6 N	10 2	07375	205	205 123	OW
No 208	75 29 N	165 28	Jun 27, 23	18 0	7 18 E					205		FM
No 203	75 28 N	164 30	Jun 20, 23	21 0	5 46 E					205		HUS
No 207	75 28 N	165 41	Jun 26, 23	17 9	7 22 E	10 6	82 45 6 N	10 6	07281	205	205 123	S&W
No 204	75 27 N	164 55	Jun 21, 23	18 2	6 00 E					205		HUS
No 221	75 26 N	166 45	Jul 30, 23	17 5	8 14 9 E					8		FM
No 247	75 25 N	163 44	Sep 25, 23	9 1	5 23 6 E			10 3,11 5	07404	8		S&M
No 205	75 25 N	165 10	Jun 22, 23			10 7	82 41 2 N	10 7	07360	205	205 123	OW
No 212	75 24 N	164 38	Jul 10, 23			10 7	82 40 1 N	10 7	07394	205	205 123	OW
			Jul 10, 23	17 3	5 40 3 E					8		FM
No 216	75 24 N	167 06	Jul 20, 23			10 7	82 35 1 N	10 7	07491	205	205 123	OW
No 286	75 23 N	158 03	Dec 29, 23	12 2	2 19 0 E					8		FM
No 206	75 23 N	165 25	Jun 23, 23	17 8	7 14 E					205		HUS
No 218	75 23 N	167 28	Jul 23, 23	17 1	6 45 7 E					8		FM
No 284	75 22 N	158 00	Dec 27, 23	12 4	2 20 1 E					8		FM
No 285	75 22 N	158 02	Dec 28, 23			15 5	82 43 6 N	15 5	07377	205	205 123	OW
No 217	75 22 N	167 19	Jul 21, 23	18 1	6 12 3 E					8		FM
No 324	75 21 N	157 47	Apr 4, 24	16 4	2 17 3 E					8		FM
No 202	75 21 N	164 32	Jun 18, 23			10 8	82 37 3 N	10 7	07440	205	205 123	OW
No 219	75 21 N	166 52	Jul 26, 23			10 7	82 33 2 N	10 7	07530	205	205 123	OW
			Jul 26, 23	17 5	6 33 1 E					8		FM
No 220	75 21 N	166 53	Jul 27, 23					10 7,11 9	07488	8		HUS
No 323	75 20 N	157 51	Apr 3, 24			9 8	82 46 7 N	9 8	07293	205	205 236	OW
No 287	75 20 N	158 04	Dec 31, 23			11 6	82 47 4 N	11 6	07290	205	205 123	HUS
No 297	75 19 N	156 22	Jan 24, 24	10 4,11 7	1 27 8 E			10 4,11 7	07373	8		HUS
No 322	75 19 N	157 55	Apr 2, 24	15 6	2 10 4 E					8		FM
No 281	75 19 N	158 29	Dec 20, 23	15 1	2 38 8 E			10 1,11 6	07383	8		S&M
No 318	75 18 N	158 04	Mar 24, 24			10 4	82 43 4 N	10 4	07350	205	205 236	OW
			Mar 24, 24	15 6	2 01 8 E					8		FM
No 282	75 18 N	158 34	Dec 21, 23			10 3	82 43 1 N	10 3	07366	205	205 123	OW
No 283	75 18 N	158 38	Dec 22, 23	12 8	2 33 3 E					8		FM
No 298	75 17 N	156 26	Jan 25, 24			10 3	82 46 2 N	10 3	07294	205	205 236	OW
No 321	75 17 N	158 01	Mar 31, 24	15 8	2 04 1 E					8		FM
No 320	75 17 N	158 05	Mar 28, 24			10 0	82 43 7 N	10 0	07338	205	205 236	OW
			Mar 28, 24	15 7	2 26 4 E					8		FM
No 319	75 17 N	158 15	Mar 26, 24	15 7	2 19 0 E			10 0,11 7	07356	8		S&M
No 266	75 17 N	159 16	Nov 17, 23	8 9	2 57 8 E					8		FM
No 201	75 17 N	164 32	Jun 17, 23	17 7	5 38 3 E					8		FM
No 299	75 16 N	156 30	Jan 26, 24	9 0	1 20 2 E					8		FM
No 296	75 16 N	156 46	Jan 21, 24			10 4	82 43 6 N	10 4	07346	205	205 236	OW
			Jan 21, 24	14 9	1 35 5 E					8		FM
No 316	75 16 N	158 35	Mar 19, 24	15 3	2 20 4 E					8		FM
No 274	75 16 N	158 59	Dec 5, 23	9 1	3 20 0 E					8		FM
No 317	75 15 N	158 16	Mar 22, 24			10 4	82 42 2 N	10 4	07360	205	205 236	OW
			Mar 22, 24	15 3	2 07 4 E					8		FM
No 275	75 15 N	158 57	Dec 7, 23	9 0	2 51 2 E					8		FM
			Dec 7, 23			10 8	82 38 2 N	10 7	07453	205	205 123	OW
No 267	75 15 N	159 11	Nov 19, 23			10 2	82 40 0 N	10 2	07417	205	205 123	OW
			Nov 19, 23	16 4	2 55 6 E					8		FM
No 268	75 15 N	159 20	Nov 21, 23					10 4,11 9	07455	8		HUS
No 269	75 15 N	159 27	Nov 23, 23			10 2	82 42 0 N	10 2	07369	205	205 123	OW
No 270	75 15 N	159 31	Nov 24, 23	9 0	2 57 3 E					8		FM
No 265	75 15 N	159 35	Nov 16, 23			10 4	82 38 6 N	10 4	07482	205	205 123	OW
No 280	75 14 N	158 46	Dec 18, 23	14 8	2 39 6 E					8		FM
No 279	75 14 N	158 50	Dec 17, 23			10 5	82 44 5 N	10 5	07350	205	205 123	OW
No 273	75 14 N	159 14	Dec 3, 23	9 0	2 58 2 E					8		FM
			Dec 3, 23			10 6	82 38 7 N	10 5	07444	205	205 123	OW
No 248	75 14 N	163 55	Sep 28, 23			10 0	82 43 0 N	10 0	07382	205	205 123	OW
			Sep 28, 23	15 7	5 26 9 E					8		FM
No 301	75 13 N	156 32	Jan 31, 24	9 0	1 29 7 E					8		FM
No 300	75 13 N	156 36	Jan 28, 24			10 3	82 41 8 N	10 3	07381	205	205 236	OW
			Jan 28, 24	17 7	1 26 4 E					8		FM
No 302a	75 13 N	156 38	Feb 1, 24			10 4	82 41 0 N	10 3	07455	205	205 236	OW

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 302b	75 13 N	156 45	Feb 2, '24	8 9	1 32 2 E					8		FM
No 315	75 13 N	158 45	Mar 17, 24			10 5	82 38 0 N	10 4	*07442*	*205*	205 236	OW
			Mar 17, 24	15 4	2 22 9 E					8		FM
No 276	75 13 N	159 02	Dec 12, 23	9 0	2 44 7 E					8		FM
No 277	75 13 N	159 02	Dec 13, 23			11 1	82 37 3 N	11 1	*07472*	*205*	205 123	OW
			Dec 13, 23			11 2	82 36 9 N	11 1	*07480*	*205*	205 67(3)	OW
No 303	75 12 N	156 57	Feb 4, 24			11 2	82 42 3 N	11 2	*07380*	*205*	205 123	OW
			Feb 4, 24			11 3	82 41 7 N	11 3	*07417*	*205*	205 67(3)	OW
			Feb 4, 24	17 9	1 42 8 E			15 8,17 0	07378	8		S&M
No 314	75 12 N	158 38	Mar 14, 24			10 7	82 38 6 N	10 7	*07419*	*205*	205 236	OW
			Mar 14, 24	20 3	2 20 4 E					8		FM
No 312	75 12 N	158 47	Mar 10, 24			10 7	82 38 4 N	10 7	*07422*	*205*	205 236	OW
			Mar 10, 24	19 6	2 19 8 E					8		FM
No 278	75 12 N	159 01	Dec 14, 23	15 0	2 42 4 E					8		FM
No 271	75 12 N	159 42	Nov 26, 23			10 3	82 38 7 N	10 3	*07442*	*205*	205 123	OW
			Nov 26, 23	16 5	2 55 4 E					8		FM
No 200	75 12 N	164 40	Jun 15, 23			9 8	82 34 0 N	9 8	*07501*	*205*	205 123	OW
No 305	75 11 N	157 39	Feb 8, 24			10 5	82 37 8 N	10 5	*07505*	*205*	205 236	OW
			Feb 8, 24	17 4	2 08 8 E					8		FM
No 313	75 11 N	158 37	Mar 12, 24	20 4	2 13 2 E					8		FM
No 306	75 11 N	158 45	Feb 12, 24			10 6	82 35 0 N	10 6	*07553*	*205*	205 236	OW
No 293	75 10 N	157 20	Jan 16, 24	17 7	1 51 5 E					8		FM
No 294	75 10 N	157 21	Jan 18, 24			10 5	82 37 2 N	10 5	*07456*	*205*	205 236	OW
No 295	75 10 N	157 21	Jan 19, 24	8 9	1 57 8 E					8		FM
No 292	75 10 N	157 23	Jan 14, 24			10 4	82 41 0 N	10 4	*07384*	*205*	205 236	OW
			Jan 14, 24	14 8	1 47 5 E					8		FM
No 304	75 10 N	157 38	Feb 6, 24	17 6	2 10 2 E					8		FM
No 264	75 09 N	160 40	Nov 12, 23			10 3	82 28 3 N	10 3	*07607*	*205*	205 123	OW
No 291	75 08 N	157 30	Jan 12, 24	9 0	1 59 5 E					8		FM
No 272	75 08 N	159 39	Nov 30, 23	9 0	2 54 8 E					8		FM
			Nov 30, 23			10 6	82 31 6 N	10 6	*07564*	*205*	205 123	OW
No 308	75 07 N	159 00	Feb 22, 24			10 2	82 33 0 N	10 2	*07624*	*205*	205 236	OW
			Feb 22, 24	17 9	2 31 5 E					8		FM
No 310	75 06 N	159 27	Mar 3, 24			10 3	82 29 3 N	10 3	*07578*	*205*	205 236	OW
			Mar 3, 24	19 8	2 48 4 E					8		FM
No 199	75 06 N	164 48	Jun 13, 23	9 4	6 21 0 E					8		FM
No 290	75 05 N	157 47	Jan 11, 24			10 4	82 32 9 N	10 4	*07526*	*205*	205 236	OW
No 307	75 05 N	159 01	Feb 19, 24			10 6	82 32 4 N	10 6	*07602*	*205*	205 236	OW
			Feb 19, 24	17 9	2 28 0 E					8		FM
No 263	75 05 N	161 20	Nov 9, 23			10 3	82 26 1 N	10 2	*07645*	*205*	205 123	OW
No 255	75 05 N	162 55	Oct 18, 23	18 3	4 42 8 E					8		FM
No 198	75 05 N	164 44	Jun 11, 23			17 3	82 22 3 N	17 3	*07705*	*205*	205 123	OW
No 311	75 04 N	159 01	Mar 7, 24			11 0	82 33 7 N	10 9	*07499*	*205*	205 236	OW
			Mar 7, 24	20 9	2 27 9 E					8		FM
No 309	75 04 N	159 22	Feb 25, 24			10 4	82 28 7 N	10 3	*07666*	*205*	205 236	OW
			Feb 25, 24	19 8	2 54 3 E					8		FM
No 196	75 04 N	164 41	Jun 7, 23	17 3	5 34 8 E					8		FM
No 197	75 04 N	164 43	Jun 8, 23			15 9	82 11 0 N	15 9	*07886*	*205*	205 123	OW
No 260	75 03 N	161 40	Nov 5, 23	17 7	3 57 4 E					8		FM
No 261	75 03 N	161 43	Nov 6, 23			10 4	82 22 8 N	10 4	*07697*	*205*	205 123	OW
No 262	75 02 N	161 46	Nov 7, 23	18 0	3 59 2 E					8		FM
No 256	75 02 N	162 44	Oct 19, 23			10 0	82 13 3 N	10 0	*07885*	*205*	205 123	OW
No 288	74 58 N	158 46	Jan 7, 24	9 7	2 14 2 E					8		FM
			Jan 7, 24			15 5	82 29 4 N	15 5	*07585*	*205*	205 236	OW
No 249	74 58 N	164 15	Oct 1, 23			9 9	82 14 1 N	9 9	*07844*	*205*	205 123	OW
No 289	74 57 N	158 22	Jan 9, 24	9 4	2 02 9 E					8		FM
No 254	74 57 N	164 20	Oct 15, 23			9 9	82 08 9 N	9 9	*07916*	*205*	205 123	OW
No 195	74 56 N	165 00	Jun 4, 23			10 4	82 10 4 N	10 5	*07892*	*205*	205 123	OW
No 194	74 55 N	165 24	Jun 1, 23			10 7	82 12 6 N	10 7	*07862*	*205*	205 123	OW
No 193	74 55 N	165 31	May 31, 23	17 2	6 29 0 E					8		FM
No 257	74 54 N	162 10	Oct 22, 23			10 3	82 20 5 N	10 3	*07731*	*205*	205 123	OW
			Oct 22, 23	17 4	3 33 5 E					8		FM
No 259	74 53 N	161 58	Oct 26, 23			10 1	82 10 5 N	10 1	*07896*	*205*	205 123	OW
No 253	74 50 N	165 42	Oct 12, 23			10 4	82 03 0 N	10 4	*08028*	*205*	205 123	OW
			Oct 12, 23	18 1	5 37 1 E					8		FM
No 258	74 49 N	162 23	Oct 23, 23	17 5	3 50 7 E					8		FM
No 192	74 47 N	165 49	May 29, 23			11 6	82 02 0 N	11 6	*08022*	*205*	205 123	OW
			May 29, 23	17 3	6 03 0 E					8		FM
No. 339b	74 45 N	154 26	May 1, 24			10 3	83 31 6 N	10 3	*06609*	*205*	205 236	OW
No 250a	74 45 N	165 00	Oct 5, 23			11 3	82 04 8 N	11 2	*07977*	*205*	205 123	OW
			Oct 5, 23			11 3	82 04 4 N	11 2	*07984*	*205*	205 67(3)	OW
No 250b	74 45 N	165 00	Oct 5, 23					10 5,11 8	07974	8		HUS
No 184	74 43 N	166 20	May 8, 23			11 6	81 57 8 N	11 5	*08091*	*205*	205 123	OW

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ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 183	74 43 N	166 24	May 7, '23	16 6	5 44 4 E					8		FM
No 185	74 42 N	166 09	May 11, 23			11 1	82 00 1 N	11 0	08051	205	205 123	OW
			May 11, 23	17 0	5 33 1 E					8		FM
No 182	74 42 N	166 22	May 4, 23			10 6	82 05 6 N	10 6	07948	205	205 123	OW
No 186	74 41 N	166 10	May 14, 23			10 7	81 59 2 N	10 6	08077	205	205 123	OW
			May 14, 23			10 7	81 58 9 N	10 6	08074	205	205 67(3)	OW
			May 14, 23	16 6	5 40 8 E					8		FM
No 181	74 41 N	166 20	May 2, 23	16 7	5 43 8 E					8		FM
No 191a	74 40 N	166 09	May 25, 23					10 1,11 4	08080	8		HUS
No 191b (tent)	74 40 N	166 09	May 25, 23			10 9	81 58 3 N	10 9	08077	205	205 123	OW
No 251	74 39 N	165 30	Oct 8, 23			10 1	81 59 2 N	10 0	08084	205	205 123	OW
No 189	74 39 N	166 13	May 22, 23			10 4	81 59 7 N	10 4	08043	205	205 123	OW
			May 22, 23	17 0	5 35 0 E					8		FM
No 190	74 39 N	166 14	May 24, 23	17 5	5 41 6 E					8		FM
No 180	74 39 N	166 34	Apr 30, 23			10 0	82 01 5 N	10 0	08015	205	205 123	OW
			Apr 30, 23	16 6	5 48 6 E					8		FM
No 252	74 38 N	165 40	Oct 9, 23	20 6	4 56 4 E					8		FM
No 187	74 38 N	166 18	May 18, 23			10 3	82 03 9 N	10 3	07991	205	205 123	OW
No 188	74 38 N	166 20	May 19, 23	17 4	5 40 8 E					8		FM
No 179	74 29 N	167 26	Apr 27, 23			10 7	81 54 0 N	10 7	08154	205	205 123	OW
			Apr 27, 23	16 5	6 16 2 E					8		FM
No 165	74 27 N	168 56	Mar 28, 23	15.9	7 16 6 E					8		FM
No 176	74 26 N	167 51	Apr 20, 23			10 1	81 52 0 N	10 1	08169	205	205 123	OW
No 178a	74 26 N	167 51	Apr 23, 23			10 5	81 47 4 N	10 4	08253	205	205 123	OW
No 178b	74 26 N	167 50	Apr 25, 23	16 4	6 28 1 E					8		FM
No 177	74 26 N	167 52	Apr 21, 23	15 9	6 40 5 E					8		HUS
No 166	74 25 N	168 46	Mar 30, 23			10 8	81 48 6 N	10 8	08214	205	205 123	OW
No 167	74 24 N	168 35	Apr 2, 23			10 8	81 48 5 N	10 8	08231	205	205 123	OW
No 164	74 24 N	169 04	Mar 26, 23			10 8	81 43 0 N	10 7	08314	205	205 123	OW
			Mar 26, 23	15 9	6 49 7 E					8		FM
No 168	74 22 N	168 31	Apr 4, 23	15 8	6 55 8 E					8		FM
No 175	74 21 N	168 31	Apr 18, 23	16 5	6 43 1 E					8		FM
No 172	74 20 N	168 25	Apr 12, 23	16 5	6 42 2 E					8		FM
No 173	74 20 N	168 26	Apr 13, 23			10 8	81 44 8 N	10 8	08300	205	205 123	OW
No 171	74 20 N	168 28	Apr 11, 23					10 1,11 2	08248	8		HUS
No 169	74 20 N	168 32	Apr 6, 23			10 0	81 46 6 N	10 0	08247	205	205 123	OW
			Apr 6, 23	15 7	6 49 0 E					8		FM
No 170	74 20 N	168 35	Apr 9, 23			10 8	81 47 6 N	10 8	08230	205	205 123	OW
			Apr 9, 23	16 6	6 47 5 E					8		FM
No 174	74 19 N	168 28	Apr 16, 23			10 2	81 46 0 N	10 3	08262	205	205 123	OW
			Apr 16, 23	16 3	6 53 5 E					8		FM
No 145	74 17 N	169 59	Feb 20, 23			11 0	81 40 3 N	11 0	08355	205	205 123	OW
			Feb 20, 23	18 3	7 45 7 E					8		FM
No 163	74 16 N	169 30	Mar 24, 23			10 3	81 41 5 N	10 3	08336	205	205 123	OW
No 162	74 13 N	169 43	Mar 23, 23	15 6	7 26 8 E					8		FM
No 144	74 13 N	169 55	Feb 19, 23	19 6	7 37 7 E					8		FM
No 161	74 12 N	169 46	Mar 21, 23	15 7	7 31 1 E					8		FM
No 160	74 11 N	169 42	Mar 20, 23			11 0	81 38 6 N	11 0	08367	205	205 123	OW
No 159	74 10 N	169 38	Mar 19, 23	15 8	7 03 6 E					8		FM
No 158	74 10 N	169 45	Mar 17, 23			11 0	81 37 7 N	11 0	08384	205	205 123	OW
No 157	74 10 N	169 49	Mar 16, 23	15 6	7 35 6 E					8		FM
No 153	74 10 N	169 52	Mar 8, 23	20 6	7 51 6 E					8		FM
No 156	74 10 N	169 58	Mar 13, 23			10 6	81 38 0 N	10 6	08385	205	205 123	OW
No 147	74 10 N	170 03	Feb 23, 23					16 0,17 2	08348	8		HUS
No 155	74 10 N	170 04	Mar 12, 23	15 6	7 46 7 E					8		FM
No 154	74 09 N	170 13	Mar 10, 23			10 5	81 38 4 N	10 5	08385	205	205 123	OW
			Mar 10, 23	15 5	7 50 1 E					8		FM
No 148	74 07 N	170 05	Feb 24, 23			10 8	81 40 7 N	10 8	08330	205	205 123	OW
No 143	74 06 N	170 05	Feb 17, 23			10 1	81 32 4 N	10 0	08477	205	205 123	OW
No 140	74 06 N	170 16	Feb 12, 23	17 5	7 54 7 E					8		FM
No 149	74 05 N	170 06	Feb 25, 23	19 7	7 45 5 E					8		FM
No 141	74 05 N	170 15	Feb 13, 23			11 8	81 35 9 N	11 8	08443	205	205 123	OW
No 142	74 04 N	170 10	Feb 16, 23	19 8	7 50 5 E					8		FM
No 152	74 02 N	170 28	Mar 6, 23			11 3	81 35 7 N	11 4	08440	205	205 123	OW
			Mar 6, 23	19 3	8 02 4 E					8		FM
No 151	74 01 N	170 47	Mar 3, 23			10 7	81 34 7 N	10 7	08455	205	205 123	OW
			Mar 3, 23	19 6	7 59 8 E					8		FM
No 139	74 00 N	170 32	Feb 10, 23			11 0	81 33 7 N	11 1	08480	205	205 123	OW
No 150	73 59 N	170 38	Mar 1, 23	19 5	8 04 3 E	11 8	81 30 3 N	11 8	08517	8	205 123	W&M
No 137	73 54 N	170 40	Feb 7, 23	17 0	7 48 7 E					8		FM
No 138	73 54 N	170 49	Feb 8, 23	17 2	7 50 4 E					8		FM
No 136	73 53 N	170 39	Feb 6, 23			16 3	81 27 3 N	16 3	08606	205	205 123	OW
No 135	73 52 N	170 38	Feb 5, 23	17 2	7 52 2 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 134	73 51 N	170 39	Feb 3, '23			11 2	81 26 7 N	11 2	08611	205	205 123	OW
No 133	73 50 N	170 39	Feb 2, 23	17 4	7 53 7 E					8		FM
No 132	73 42 N	171 16	Jan 30, 23			11 9	81 12 3 N	11 9	08846	205	205 123	OW
			Jan 30, 23			11 9	81 12 3 N	11 9	08834	205	205 67(3)	OW
			Jan 30, 23	16 4	7 36 7 E					8		FM
No 131	73 42 N	171 25	Jan 28, 23	17 5	7 32 0 E					8		FM
No 130	73 40 N	171 12	Jan 26, 23			11 0	81 13 2 N	10 9	08838	205	205 123	OW
No 127	73 39 N	170 51	Jan 22, 23	16 8	7 29 2 E					8		FM
No 128	73 39 N	170 54	Jan 23, 23			11 4	81 09 5 N	11 4	08902	205	205 123	OW
No 129	73 39 N	170 58	Jan 24, 23	16 7	7 16 9 E					8		FM
No 125	73 36 N	169 38	Jan 17, 23			11 1	81 15 9 N	11 1	08786	205	205 123	OW
			Jan 17, 23	17 2	7 14 3 E					8		FM
No 120	73 35 N	170 06	Jan 9, 23	17 4	7 12 6 E					8		FM
No 121	73 34 N	170 08	Jan 10, 23			10 7	81 09 4 N	10 6	08907	205	205 123	OW
No 123	73 34 N	170 10	Jan 12, 23					10 6,11 9	08894	8		HUS
No 124	73 34 N	170 10	Jan 13, 23			10 7	81 10 7 N	10 7	08897	205	205 123	OW
			Jan 13, 23	17 4	7 12 0 E					8		FM
No 122	73 34 N	170 11	Jan 11 23	15 9	7 05 5 E					8		FM
No 126	73 33 N	169 58	Jan 20, 23	17 4	7 05 2 E					8		FM
No 119	73 33 N	170 24	Jan 6, 23	9 0	7 03 3 E					8		FM
			Jan 6, 23			10 7	81 07 5 N	10 7	08929	205	205 123	OW
No 110	73 33 N	172 05	Dec 17, 22	17 5	8 01 5 E					8		FM
No 111	73 32 N	172 08	Dec 19, 22			10 7	81 05 4 N	10 7	08938	205	205 123	OW
			Dec 19, 22	14 9	8 03 0 E					8		FM
No 83	73 32 N	174 25	Nov 4, 22			11 4	81 05 3 N	11 2	08922	205	205 123	OW
			Nov 4, 22			11 8	81 04 7 N	12 1	08914	205	205 67(3)	OW
			Nov 4, 22	18 3	10 15 9 E					8		HUS
No 112	73 31 N	172 09	Dec 20, 22					11 0,12 3	08940	8		HUS
No 113	73 31 N	172 11	Dec 23, 22			10 0	81 04 4 N	9 9	09003	205	205 123	HUS
			Dec 23, 22	17 4	8 06 9 E					8		FM
No 84	73 29 N	174 26	Nov 5, 22	17 8	10 21 2 E					8		FM
No 109	73 28 N	172 19	Dec 16, 22	9 0	8 37 4 E					8		FM
No 106	73 28 N	173 05	Dec 12, 22			11 8	81 03 9 N	11 6	08925	205	205 123	OW
			Dec 12, 22			12 0	81 04 6 N	12 1	08924	205	205 67(3)	OW
			Dec 12, 22	16 3	8 55 0 E					8		FM
No 118	73 27 N	171 07	Jan 4, 23	16 2	7 23 2 E					8		FM
No 114	73 26 N	171 53	Dec 28, 22	17 7	7 40 4 E					8		FM
No 117	73 25 N	171 39	Jan 2, 23			10 3	81 00 2 N	10 2	09023	205	205 123	OW
			Jan 2, 23	15 0	7 39 0 E					8		FM
No 116	73 25 N	171 44	Dec 31, 22	16 1	7 42 9 E					8		FM
No 108	73 25 N	172 36	Dec 15, 22			15 9	80 55 3 N	15 9	09101	205	205 123	HUS
No 105	73 25 N	173 12	Dec 11, 22	16 1	9 03 7 E					8		FM
No 85	73 25 N	174 21	Nov 7, 22			11 3	81 01 6 N	11 3	08976	205	205 123	OW
No 115	73 25 N	171 48	Dec 29, 22			11 4	80 58 5 N	11 4	09058	205	205 123	OW
			Dec 29, 22	16 7	7 38 2 E					8		FM
No 107	73 22 N	172 54	Dec 14, 22	15 6	8 38 1 E					8		FM
No 82	73 22 N	175 05	Oct 31, 22			10 7	80 56 2 N	10 6	09016	205	205 123	OW
No 86	73 21 N	174 16	Nov 9, 22			10 6	80 57 5 N	10 6	09084	205	205 123	OW
			Nov 9, 22	17 5	10 20 7 E					8		FM
No 94	73 16 N	173 53	Nov 18, 22	18 3	9 42 2 E					8		FM
No 95	73 16 N	173 54	Nov 19, 22	17 3	9 48 3 E					8		FM
No 99	73 15 N	173 32	Nov 29, 22			11 3	80 49 9 N	11 4	09164	205	205 123	OW
			Nov 29, 22	16 4	9 07 2 E					8		FM
No 90	73 15 N	173 52	Nov 14, 22			11 2	80 51 4 N	11 2	09145	205	205 123	OW
No 93	73 15 N	174 01	Nov 17, 22			10 8	80 52 4 N	10 8	09127	205	205 123	OW
			Nov 17, 22	17 2	10 00 8 E					8		FM
No 92	73 15 N	174 04	Nov 16, 22	17 0	9 58 5 E					8		FM
No. 87	73 15 N	174 28	Nov 10, 22	17 4	10 22 4 E					8		FM
No 100	73 14 N	173 32	Nov 30, 22	16 4	9 26 0 E					8		FM
No 103	73 14 N	173 44	Dec 8, 22	9 2	9 32 6 E					8		FM
No 89	73 14 N	174 04	Nov 13, 22	17 6	9 58 0 E					8		FM
No 91	73 14 N	174 08	Nov 15, 22	18 2	9 56 1 E					8		FM
No 88a	73 14 N	174 28	Nov 11, 22	18 0	9 42 4 E			11 5,13 0	09172	8		S&M
No 88b	73 14 N	174 28	Nov 11, 22			12 1	80 49 7 N	12 1	09176	205	205 123	OW
No 101	73 13 N	173 26	Dec 2, 22			11 2	80 48 0 N	11 2	09201	205	205 123	OW
			Dec 2, 22	17 7	9 21 2 E					8		FM
No 104	73 13 N	173 34	Dec 9, 22			11 1	80 49 5 N	11 1	09182	205	205 123	OW
			Dec 9, 22	18 2	9 15 6 E					8		FM
No 98	73 13 N	173 40	Nov 27, 22	9 7	9 27 2 E			11 0,12 7	09164	8		S&M
No 102	73 13 N	173 57	Dec 6, 22	9 3	9 29 7 E					8		FM
			Dec 6, 22			11 8	80 49 3 N	11 8	09172	205	205 123	OW
No 96	73 12 N	173 41	Nov 21, 22			11 5	80 49 9 N	11 5	09169	205	205 123	OW
			Nov 21, 22	20 1	9 37 8 E					8		FM

ARCTIC REGION

ARCTIC SEA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 97	73 12 N	173 50	Nov 24, '22			11 6	80 49 6 N	11 6	*09173*	*205*	205 123	OW
			Nov 24, 22	16 9	9 23 9 E					8		FM
No 81*a*	73 10 N	175 40	Oct 28, 22			11 2	80 50 1 N	11 2	*09140*	*205*	205 123	OW
No 81*b*	73 10 N	175 40	Oct 28, 22					11 0,12 8	09179	8		HUS
No 80	73 06 N	175 52	Oct 27, 22	18 0	11 52 8 E					8		FM
No 79	73 06 N	175 55	Oct 26, 22			10 8	80 50 1 N	10 8	*09163*	*205*	205 123	OW
			Oct 26, 22	18 0	11 54 7 E					8		FM
No 78	73 06 N	176 07	Oct 25, 22	9 0,14 0	12 03 8 E					8		HUS
No 77	73 05 N	176 19	Oct 24, 22			10 7	81 00 2 N	10 7	*09019*	*205*	205 123	OW
No 75	73 02 N	176 45	Oct 22, 22					10 0,11 3	08938	8		HUS
No 74	73 00 N	176 58	Oct 21, 22			10 8	81 04 0 N	10 8	*08914*	*205*	205 123	OW
No 73	72 58 N	177 10	Oct 20, 22	9 1	11 36 2 E					8		HUS
No 63	72 58 N	184 15	Sep 30, 22			12 2	80 51 1 N	12 2	*09114*	*205*	205 123	OW
No 72	72 51 N	177 14	Oct 19, 22	8 9	10 42 8 E					8		HUS
No 71	72 50 N	177 25	Oct 18, 22	11 2	10 55 6 E					8		HUS
			Oct 18, 22	15 1	10 59 E	16 5	80 24 1 N	16 5	*09629*	*205*	205 123	S&W
No 64	72 49 N	180 47	Oct 7, 22	11 7	13 48 E	10 5	80 45 3 N	10 4	*09249*	*205*	205 123	HUS
No 70	72 48 N	177 36	Oct 17, 22	19 2	10 50 7 E					8		FM
No 66	72 42 N	179 10	Oct 13, 22	16 4	12 12 2 E					8		HUS
No 65	72 41 N	179 43	Oct 12, 22	15 8,17 8	13 25 E	16 8	80 34 9 N	16 7	*09418*	*205*	205 123	HUS
No 50	72 22 N	185 36	Aug 25, 22	9 1,11 0	16 54 E	10 1	80 33 2 N	10 1	*09432*	*205*	205 123	HUS
No 62	72 19 N	188 46	Sep 9, 22	9 2,11 1	19 46 E	10 2	80 35 7 N	10 2	*09398*	*205*	205 123	HUS
No 61	72 10 N	188 25	Sep 4, 22	14 7,16 5	19 34 E	15 6	80 21 6 N	15 6	*09647*	*205*	205 123	HUS
No 60	72 01 N	187 20	Aug 30, 22	14 0	18 25 E	15 1	80 00 9 N	15 1	*09917*	*205*	205 123	HUS
No 58	71 58 N	184 51	Aug 16, 22	14 5,16 1	15 46 E	15 3	79 54 2 N	15 3	*10056*	*205*	205 123	HUS
No 57	71 16 N	184 54	Aug 8, 22	14 7,16 2	15 47 E	15 5	79 27 3 N	15 5	*10433*	*205*	205 123	HUS
No 56	70 35 N	185 40	Aug 5, 22			9 7	78 58 6 N	9 6	*10893*	*205*	205 123	HUS

ASIA

SIBERIA

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 360	70 43 8 N	162 30	Oct 2, '24	15 8	0 13 4 W					8		HUS
			Oct 3, 24	10 5,10 7,11 0	0 11 4 W					8		FM
			Oct 3, 24	11 3,11 8,12 0	0 14 4 W					8		FM
			Oct 3, 24	14 8,15 1,15 4	0 15 W					*205*		HUS
			Oct 3, 24	15 7,16 0,16 3	0 15 W					*205*		HUS
			Oct 8, 24	12 4	0 14 7 W					8		HUS
			Oct 9, 24			10 3	79 14 0 N	10 2	*10735*	*205*	205 236	OW
			Oct 9, 24	14 5 to								
			Oct 10, 24	14 5 (dv)	0 13 5 W					8		M Ex[1]
			Oct 11, 24	9 0,11 2	0 15 1 W			9 6,10 7	10736	8		HUS
			Oct 13, 24	9 5 to								
			Oct 14, 24	9 5 (dv)	0 12 5 W					8		M Ex[1]
			Oct 14, 24					11 4,12 4	10744	8		HUS
			Oct 14, 24					14 0,15 0	10750	8		HUS
			Oct 14, 24					15 8,16 0	10764	8		HUS
			Oct 15, 24			9 8	79 14 0 N	9 8	*10747*	*205*	205 236	OW
			Oct 15, 24			11 5	79 13 9 N	11 5	*10748*	*205*	205 236	OW
			Oct 15, 24			15 2	79 12 9 N	15 2	*10765*	*205*	205 236	OW
			Oct 16, 24	9 5 to								
			Oct 17, 24	9 5 (dv)	0 12 6 W					8		M Ex[1]
No 360*b*	70 43 8 N	162 30	Oct 3, 24	10 4,10 6,11 0	0 12 W					*205*		HUS
			Oct 3, 24	11 3,11 8,12 0	0 12 W					*205*		HUS
			Oct 3, 24	14 8,15 1,15 4	0 15 4 W					8		FM
			Oct 3, 24	15 7,16 0,16 3	0 14 5 W					8		FM
No 360*c*	70 43 8 N	162 30	Oct 14, 24			11 6	79 14 6 N	11 6	*10739*	*205*	205 236	OW
			Oct 14, 24			14 5	79 14 6 N	14 4	*10734*	*205*	205 236	OW
			Oct 14, 24			16 2	79 13 0 N	16 2	*10767*	*205*	205 236	OW
			Oct 15, 24					9 4,10 3	10756	8		HUS
			Oct 15, 24					11 1,12 1	10747	8		HUS
			Oct 15, 24					14 6,15 5	10754	8		HUS
No 360*d*	70 43 2 N	162 25	Nov 13, 24			15 1	79 06 6 N	15 1	*10846*	*205*	205 236	OW
			Nov 14, 24	9 5 to 16 5 (dv)	0 18 4 W					8		S&M
			Nov 20, 24			11 5	79 06 0 N	11 4	*10879*	*205*	205 236	OW
			Nov 21, 24	12 7	0 13 3 W					8		HUS
			Nov 22, 24	10 4,12 6	0 15 1 W			11 0,12 0	10865	8		HUS
			Nov 25, 24	11 5	0 22 5 W					8		FM
			Nov 26, 24	12 6	0 16 5 W					8		HUS

[1] These 24-hour observations were made by all members of the party in turn

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SIBERIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination		Inclination		Hor Intensity		Instruments		Obs'r
				Local Mean Time	Value	L M T	Value	L M T	Value	Mag'r	Dip Circle	
	° ′	° ′		*h h h*	° ′	*h h*	° ′	*h h*	*c g s*			
No 360*d*—*Continued*	70 43 2 N	162 25	Nov 27, '24	11 6	0 15 3 W					8		FM
			Nov 28, 24			12 1	79 07 6 N	12 0	*10850*	*205*	205 236	OW
			Dec 1, 24	9 8	0 15 3 W					8		FM
			Dec 3, 24	12 8	0 17 1 W					8		FM
			Dec 4, 24			11 3	79 06 4 N	11 3	*10872*	*205*	205 236	OW
			Dec 4, 24	12 8	0 16 7 W					8		HUS
			Dec 5, 24	12 8	0 15 4 W					8		FM
			Dec 6, 24	10 0,12 4	0 14 6 W			10 6,11 8	10857	8		HUS
			Dec 8, 24	12 7	0 15 2 W					8		FM
			Dec 9, 24	12 6	0 13 5 W					8		HUS
			Dec 10, 24	12 8	0 14 1 W					8		FM
			Dec 11, 24	12 2	0 10 8 W					8		HUS
			Dec 12, 24			11 1	79 07 9 N	11 1	*10845*	*205*	205 36(3)	OW
			Dec 12, 24	12 7	0 26 4 W					8		FM
			Dec 13, 24	12 9	0 15 9 W					8		FM
			Dec 15, 24	12 5	0 15 7 W					8		FM
			Dec 16, 24	14 7	0 14 1 W					8		FM
			Dec 17, 24	12 5	0 14 2 W					8		FM
			Dec 18, 24			11 2	79 06 7 N	11 2	*10867*	*205*	205 36(3)	OW
			Dec 18, 24	12 8	0 15 1 W					8		HUS
			Dec 19, 24	12 9	0 15 2 W					8		FM
			Dec 20, 24	12 3	0 19 4 W			10 4,11 8	10864	8		HUS
			Dec 22, 24	12 1	0 16 2 W					8		FM
			Dec 23, 24	12 8	0 23 1 W					8		FM
			Dec 25, 24	12 9	0 15 5 W					8		HUS
			Dec 26, 24	12 7	0 14 6 W					8		HUS
			Dec 27, 24	12 4	0 13 4 W					8		FM
			Dec 29, 24	12 8	0 12 8 W					8		HUS
			Dec 30, 24	12 4	0 14 7 W					8		FM
			Dec 31, 24	12 6	0 15 3 W					8		HUS
			Jan 1, 25	12 4	0 14 8 W					8		HUS
			Jan 2, 25	12 6	0 16 4 W					8		FM
			Jan 3, 25	11 5	0 13 0 W					8		FM
			Jan 5, 25	12 4	0 15 8 W					8		FM
			Jan 6, 25	12 4	0 14 5 W					8		FM
			Jan 7, 25			10 6	79 08 1 N	10 6	*10844*	*205*	205 36(3)	OW
			Jan 7, 25	12 3	0 13 9 W					8		FM
			Jan 10, 25	12 4	0 12 8 W					8		FM
			Jan 11, 25	12 5	0 13 2 W					8		FM
			Jan 13, 25	12 1	0 14 7 W					8		FM
			Jan 14, 25	10 8	0 16 8 W			11 4,12 6	10846	8		HUS
			Jan 15, 25			11 1	79 08 0 N	11 1	*10838*	*205*	205 36(3)	OW
			Jan 15, 25	12 9	0 14 1 W					8		FM
			Jan 17, 25	12 9	0 19 7 W					8		HUS
			Jan 19, 25	12 2	0 28 1 W					8		FM
			Jan 20, 25	12 9	0 38 0 W					8		FM
			Jan 21, 25	12 8	0 13 6 W					8		HUS
			Jan 22, 25			11 2	79 08 0 N	11 2	*10840*	*205*	205 36(3)	OW
			Jan 22, 25	12 6	0 15 5 W					8		FM
			Jan 23, 25	12 5	0 13 5 W					8		FM
			Jan 24, 25	12 0	0 20 2 W					8		FM
			Jan 26, 25	14 8	0 15 2 W					8		FM
			Jan 27, 25	11 0	0 12 8 W					8		FM
			Jan 28, 25	10 0	0 16 8 W					8		HUS
			Jan 29, 25			10 5	79 08 2 N	10 4	*10845*	*205*	205 36(3)	OW
			Jan 29, 25	14 9	0 14 5 W					8		FM
			Jan 30, 25	11 4	0 16 6 W					8		FM
			Jan 31, 25	9 8,12 0	0 17 6 W			10 4,11 4	10854	8		HUS
			Feb 2, 25	14 7	0 14 9 W					8		FM
			Feb 3, 25	11 6	0 14 4 W					8		FM
			Feb 4, 25	12 6	0 13 4 W					8		FM
			Feb 5, 25			11 2	79 07 7 N	11 3	*10845*	*205*	205 6(3)	OW
			Feb 5, 25	12 8	0 13 8 W					8		FM
			Feb 6, 25	12 9	0 14 2 W					8		FM
			Feb 9, 25	12 3	0 37 7 W					8		FM
			Feb 10, 25	9 5	0 13 2 W					8		FM
			Feb 11, 25	12 6	0 20 1 W					8		FM
			Feb 12, 25	12 8	0 17 2 W					8		FM
			Feb 13, 25			10 8	79 08 6 N	10 8	*10831*	*205*	205 36(3)	OW
			Feb 13, 25	14 7	0 19 1 W					8		FM
			Feb 18, 25	10 9,11 1	0 24 8 W					8		FM
			Feb 19, 25			10 6	79 08 5 N	10 6	*10843*	*205*	205 36(3)	OW
			Feb 19, 25	11 9	0 15 8 W					8		FM

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SIBERIA—*Continued*

Station	Latitude	Long East of Gr	Date	Declination Local Mean Time	Declination Value	Inclination L M T	Inclination Value	Hor Intensity L M T	Hor Intensity Value	Instruments Mag'r	Instruments Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 360*d*—*Concluded*	70 43 2 *N*	162 25	Feb 20, '25	9 9,11 9	0 30 4 W			10 5,11 4	10806	8		HUS
			Feb 21, 25	12 8	0 16 0 W					8		FM
			Feb 23, 25	16 4	0 16 2 W					8		FM
			Feb 24, 25	12 2	0 14 9 W					8		FM
			Feb 25, 25	12 9	0 17 1 W					8		FM
			Feb 26, 25			11 2	79 08 9 N	11 2	*10830*	*205*	205 36(3)	OW
			Feb 27, 25	12 6	0 14 2 W					8		FM
			Feb 28, 25	10 0,12 2	0 12 8 W			10 6,11 7	10855	8		HUS
			Mar 2, 25	12 7	0 09 6 W					8		FM
			Mar 3, 25	12 6	0 10 8 W					8		FM
			Mar 4, 25	12 7	0 11 9 W					8		FM
			Mar 5, 25			10 6	79 08 2 N	10 6	*10834*	*205*	205 36(3)	OW
			Mar 5, 25	12 4	0 14 2 W					8		FM
			Mar 10, 25	8 9	0 17 4 W					8		FM
			Mar 11, 25	9 6	0 14 0 W					8		FM
			Mar 12, 25			10 9	79 08 6 N	10 9	*10830*	*205*	205 36(3)	OW
			Mar 12, 25	12 8	0 18 8 W					8		FM
			Mar 13, 25	15 2	0 17 1 W					8		FM
			Mar 14, 25	9 6,11 6	0 12 4 W			10 2,11 1	10840	8		HUS
			Mar 16, 25	14 9	0 18 0 W					8		FM
			Mar 17, 25	14 7	0 17 1 W					8		FM
			Mar 18, 25	15 6	0 17 6 W					8		FM
			Mar 19, 25	17 6	0 14 7 W					8		FM
			Mar 21, 25	11 0	0 13 8 W					8		FM
			Mar 24, 25	12 7	0 13 7 W					8		FM
			Mar 25, 25	10 6	0 10 0 W					8		FM
			Mar 26, 25			10 8	79 08 5 N	10 8	*10837*	*205*	205 36(3)	OW
			Mar 26, 25	12 4	0 15 7 W					8		FM
			Mar 27, 25	12 8	0 10 0 W					8		FM
			Mar 28, 25	9 8,11 7	0 12 2 W			10 3,11 2	10830	8		HUS
			Mar 30, 25	12 3	0 15 9 W					8		FM
			Mar 31, 25	15 0	0 15 5 W					8		FM
			Apr 1, 25	11 6	0 13 0 W					8		FM
			Apr 2, 25	17 1	0 20 4 W					8		FM
			Apr 3, 25			10 7	79 08 3 N	10 7	*10840*	*205*	205 36(3)	OW
			Apr 3, 25	14 9	0 24 7 W					8		FM
			Apr 4, 25	10 6	0 13 2 W					8		FM
			Apr 6, 25	12 5	0 16 2 W					8		FM
			Apr 7, 25	15 7	0 22 2 W					8		FM
			Apr 8, 25	9 4	0 11 6 W					8		FM
			Apr 9, 25	12 4	0 15 2 W					8		FM
			Apr 11, 25	11 7	0 21 1 W					8		FM
			Apr 14, 25	11 8,16 7	0 15 2 W					8		FM
			Apr 16, 25	9 5	0 18 8 W					8		FM
			Apr 16, 25			10 7	79 08 0 N	10 7	*10832*	*205*	205 36(3)	OW
			Apr 17, 25	9 9	0 04 0 W					8		FM
			Apr 18, 25	9 6,11 7	0 11 0 W			10 1,11 1	10830	8		HUS
			Apr 20, 25	12 8	0 14 6 W					8		FM
			Apr 21, 25	12 3	0 16 5 W					8		FM
			Apr 22, 25	12 8	0 17 5 W					8		FM
			Apr 24, 25	17 6	0 16 8 W					8		FM
			Apr 25, 25	8 9	0 07 0 W					8		FM
			Apr 27, 25	17 0	0 16 1 W					8		FM
			Apr 28, 25					15 3	*10860*	*205*		OW
			Apr 29, 25	10 5,12 4	0 15 8 W					8		FM
			Apr 29, 25			15 3	79 07 1 N				205 36(3)	OW
			Apr 30, 25	12 5	0 12 6 W					8		FM
			May 1, 25	11 2	0 14 9 W					8		FM
			May 2, 25	9 4,11 4	0 13 2 W			10 0,10 9	10835	8		HUS
			May 4, 25	9 6	0 05 1 W					8		FM
			May 5, 25	12 9	0 02 3 W					8		FM
			May 6, 25	8 8	0 11 2 W					8		FM
			May 7, 25	15 2	0 16 5 W					8		FM
			May 8, 25	8 9	0 06 2 W					8		FM
			May 9, 25	12 4	0 26 6 W					8		FM
			May 11, 25	8 9	0 07 7 W					8		FM
			May 12, 25	14 8	0 18 7 W					8		FM
			May 13, 25	8 8	0 06 0 W					8		FM
			May 14, 25	10 0,12 0	0 12 4 W			10 5,11 4	10816	8		HUS
			May 14, 25			15 3	79 07 7 N	15 2	*10842*	*205*	205 36(3)	OW
			May 15, 25	8 8	0 07 4 W					8		FM
			May 18, 25	15 2	0 21 1 W					8		FM
			May 19, 25	8 9	0 14 0 W					8		FM

ASIA

SIBERIA—*Concluded*

Station	Latitude	Long East of Gr	Date	Declination: Local Mean Time	Declination: Value	Inclination: L M T	Inclination: Value	Hor Intensity: L M T	Hor Intensity: Value	Instruments: Mag'r	Instruments: Dip Circle	Obs'r
	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 360*e*	70 43 2 N	162 25	May 14, '25			10 7	79 10 1 N	10 7	*10813*	*205*	205 36(3)	OW
			May 14, 25					14 9,15 8	10844	8		HUS
No 360*f*	70 43 2 N	162 25	Oct 22, 24	9 5 to 21 5 (dv)	0 12 6 W					8		S&M
			Oct 23, 24			15 5	79 05 2 N	15 5	*10889*	*205*	205 236	OW
			Oct 27, 24	12 5 to								
			Oct 28, 24	14 5 (dv)	0 11 2 W					8		M Ex[1]
			Oct 31, 24			10 5	79 06 2 N	10 4	*10866*	*205*	205 236	OW
			Nov 4, 24	12 5 to								
			Nov 5, 24	12 5 (dv)	0 10 8 W					8		M Ex[1]
			Nov 6, 24			11 7	79 07 5 N	11 7	*10905*	*205*	205 236	OW
			Nov 7, 24					10 9,12 0	10853	8		HUS
			Nov 7, 24	12 5 to								
			Nov 8, 24	12 5 (dv)	0 10 0 W					8		M Ex[1]
			Nov 10, 24	12 5 to								
			Nov 11, 24	12 5 (dv)	0 08 9 W					8		M Ex[1]
No 54 (Kain-ge-skon)	66 03 N	189 50	Jun 30, 22	12 5	17 00 E	13 5	75 36 8 N	13 5	*13907*	*205*	205 123	HUS

[1] These 24-hour observations were made by all members of the party in turn

NORTH AMERICA

UNITED STATES

	° ′	° ′		h h h	° ′	h h	° ′	h h	c g s			
No 55 (Deering)	66 05 5 N	197 18	Jul 8, '22	16 7	21 30 1 E			16 9	13310	8		HUS
			Jul 9, 22	11 2,14 3,18 0	21 36 0 E	16 6	76 20 2 N	12 0,13 7	13296	8	205 123	HUS
			Jul 9, 22					16 6	*13318*	*205*		HUS
			Jul 12, 22	11 8,16 0	21 34 4 E	13 9	76 21 1 N			8	205 123	HUS
			Jul 12, 22			14 0	76 20 8 N	13 9	*13291*	*205*	205 67(3)	HUS
			Jul 12 22	12 3,15 7	21 36 0 E			14 0	*13344*	*205*		HUS

values agree very well In the foregoing the minus sign signifies westward movement of the magnetic needle

No corrections for diurnal variation have been applied to the results from the *Maud* Expedition, but this circumstance is probably of small importance When discussing the diurnal variation of the declination at Four Pillar Island (Station No 360), it will

TABLE 13—*Values of the Magnetic Declination for Epoch 1911 0 Entered on Charts of the Siberian Coast Issued by the Russian Hydrographic Office*

No	Station	Geographic position: North Lat	Geographic position: East Long	Declination at 1911 0
		° ′	° ′	° ′
1	Seal Bay	75 24	137 00	3 50 E
2	Stolbovoj Island	73 55	136 15	1 03 W
3	Mali Island	74 15	140 20	2 06 W
4	Cape Shelagski	70 05	170 25	5 47 E
5	Cape Medvyezhi	69 39	162 15	0 15 E
6	Kolyuchin Bay	67 07	185 30	15 04 E
7	Whalen	66 09	190 10	18 19 E
8	At Sea	74 26	120 00	5 00 E
9	Do	74 04	126 00	0 00
10	Do	73 00	133 30	3 30 W
11	Do	72 45	150 00	1 00 W
12	Do	72 12	155 00	0 00
13	Do	71 40	129 00	3 30 W

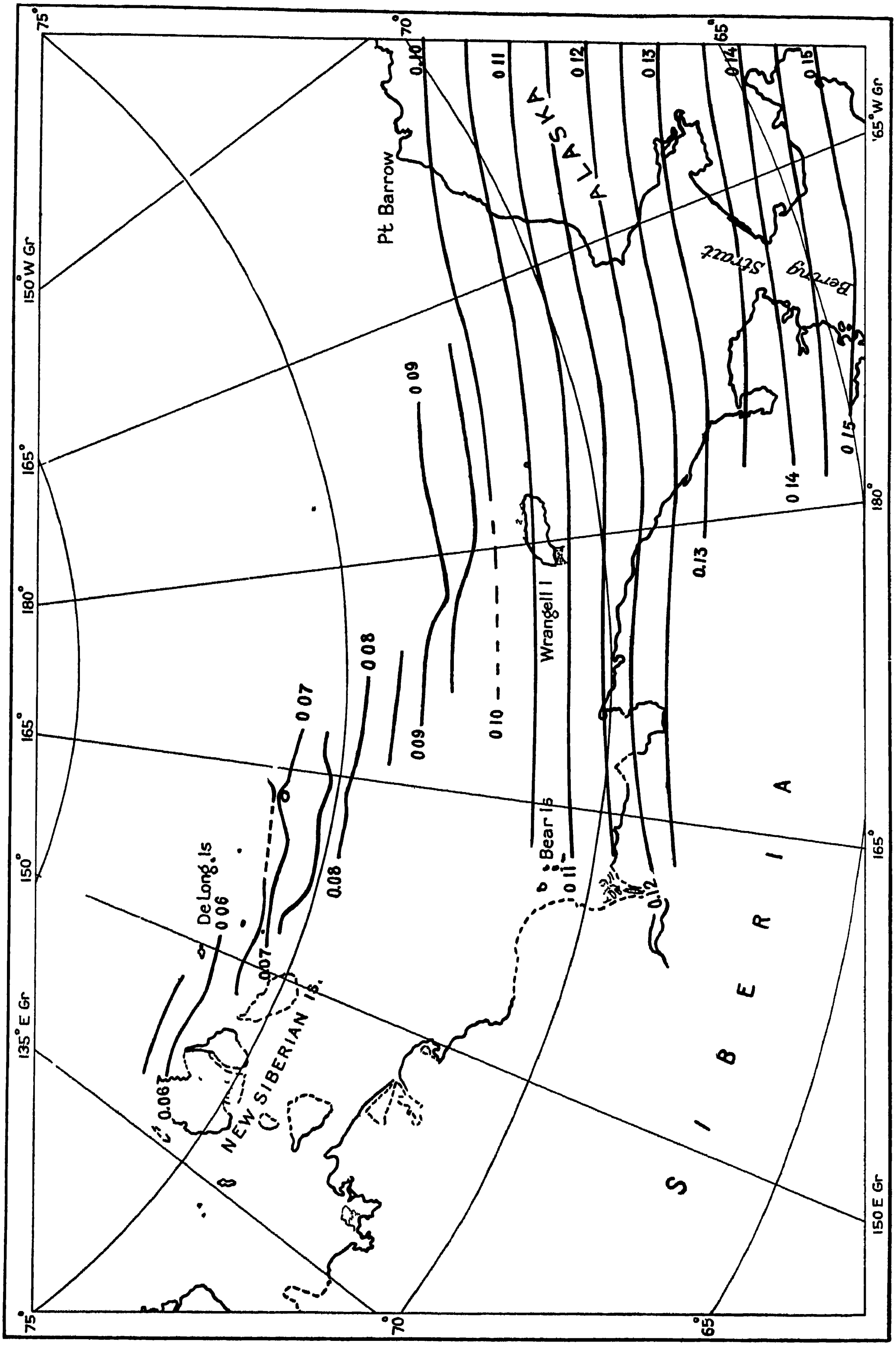


Fig 14—Lines of equal magnetic horizontal-intensity (C G S unit), Arctic Sea off north coast of Siberia, epoch 1925 0

be shown that the range of the diurnal variation is very small in the region between 160° east and 170° west longitude and around 70° north latitude, so small indeed, that the correction to the middle of the day rarely will exceed 0°1 to 0°2 This amount is smaller than deviations which are caused by magnetic disturbances Whether the diurnal variation is so small at a greater distance from the coast, where observations were taken from 1922 to 1924, is an open question, but here numerous observations are made at different hours of the day, for which reason the effect of the diurnal variation ought to be practically eliminated

The isogonics in Figure 13 show a few features to which attention may be drawn The observations during the drift of the *Maud* and the observations along the coast agree very well The dashed lines, joining the full-drawn lines over the shelf and over the coast, represent always direct continuations of the full-drawn lines

Comparing the isogonics in Figure 13 with the isogonics in the chart of the "Variation of the Compass for 1925" published by the United States Hydrographic Office or with the "Curves of Equal Magnetic Declination for 1922," published by the Royal Observatory, Greenwich, we find that the isogonics in Figure 13 differ greatly from the two other sets in the whole region west of Bering Strait The greatest discrepancy is found in the vicinity of the New Siberian Islands where the declination according to the above named sources is 10° east but according to our results 2° west, a difference of 12° The region with west declination has a much greater extension than given on the charts of the United States Hydrographic Office or of the Royal Observatory, Greenwich.

A comparison of the declination values scaled from Figure 13 and Spencer Jones's revised polar chart of 1922[3] is given in Table 14

TABLE 14—*Comparison of Declination Values Scaled from the Maud's and Jones's Isogonic Charts (East Declination +)*

No	Lat north	Long east	S = *Maud* chart 1925 0	J = Jones chart 1922	$S-J$
	°	°	°	°	°
1	65	180	8 1 E	8 0 E	+0 1
2	65	195	19 6 E	19 0 E	+0 6
3	70	165	1 0 E	2 0 E	−1 0
4	70	180	11 2 E	9 8 E	+1 4
5	70	195	22 4 E	21 6 E	+0 8
6	70	210	33 7 E	35 0 E	−1 3
7	75	135	1 2 E	7 9 E	−6 7
8	75	150	1 1 W	7 0 E	−8 1
9	75	165	5 6 E	10 0 E	−4 4

The course of the isogonics indicates beyond doubt the existence of extensive locally-disturbed regions at great distances from the coast. One region is found in latitude 76° north and between longitudes 163° and 168° east and another in latitude 75° 45′ north and longitude about 155° east The depth of the sea in the first region is between 50 and 70 meters, in the second, about 40 meters In both regions the depth is so small that magnetic deposits or rocks at the bottom of the sea may be responsible for the disturbances

The lines of equal horizontal intensity and inclination (Figs 14 and 15) cover a smaller area than the isogonics, because no observations were available from the region of the New Siberian Islands The lines over Alaska are taken from the United States Hydrographic Office charts for 1925, but for the whole region west of Bering Strait they are based on the observations of the *Maud* Expedition. No correction for secular or

[3] The revised isogonic polar chart for 1922 by H Spencer Jones, formerly of the Greenwich Observatory, is published in the December 1923 number of the Geographical Journal (see pp 419–423, and opposite p 476)

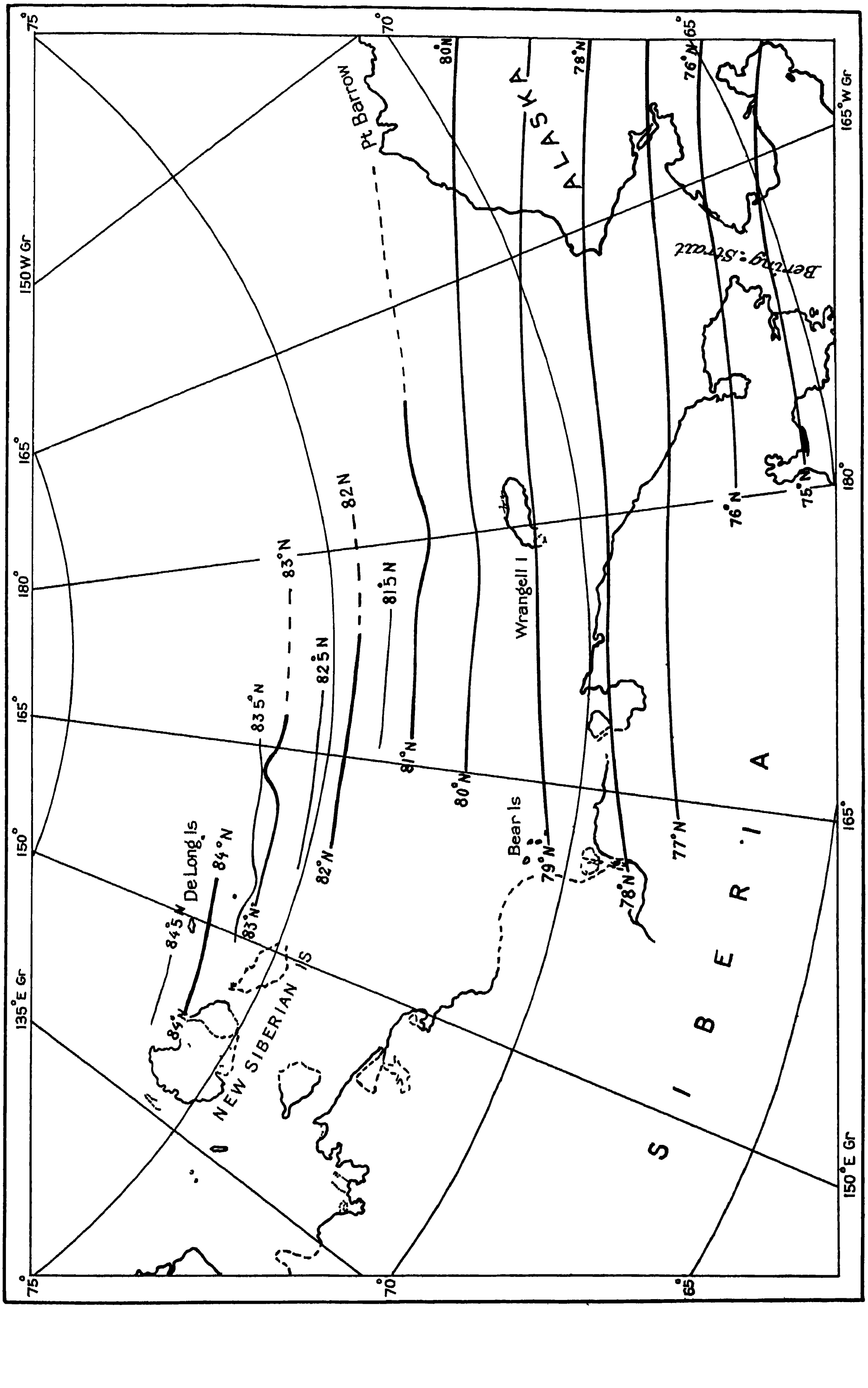


FIG 15—Lines of equal magnetic inclination, Arctic Sea off north coast of Siberia, epoch 1925 0

diurnal variation are applied to these. The first is known only for Pitlekai, where it is so small that it is of no importance for the period 1920 to 1925 in which the observations were made, and no data are available bearing upon the latter.

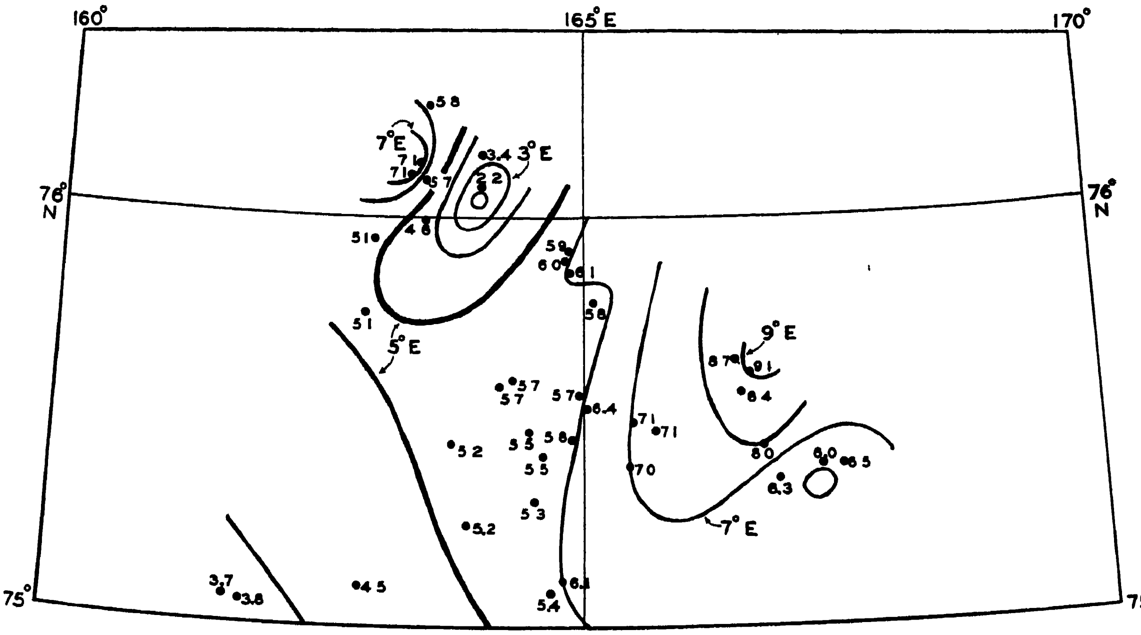


FIG 16—Magnetic declination to the nearest 0° 1 and isogonics, locally-disturbed region on Siberian shelf

The lines of horizontal intensity and inclination agree generally with the corresponding lines on the charts of the United States Hydrographic Office and of the Royal Observatory, Greenwich, for 1925 and 1922 respectively. Furthermore, we find that the regions in which the course of the isogonics indicates local disturbances are characterized also by disturbed values of the horizontal intensity and of the inclination.

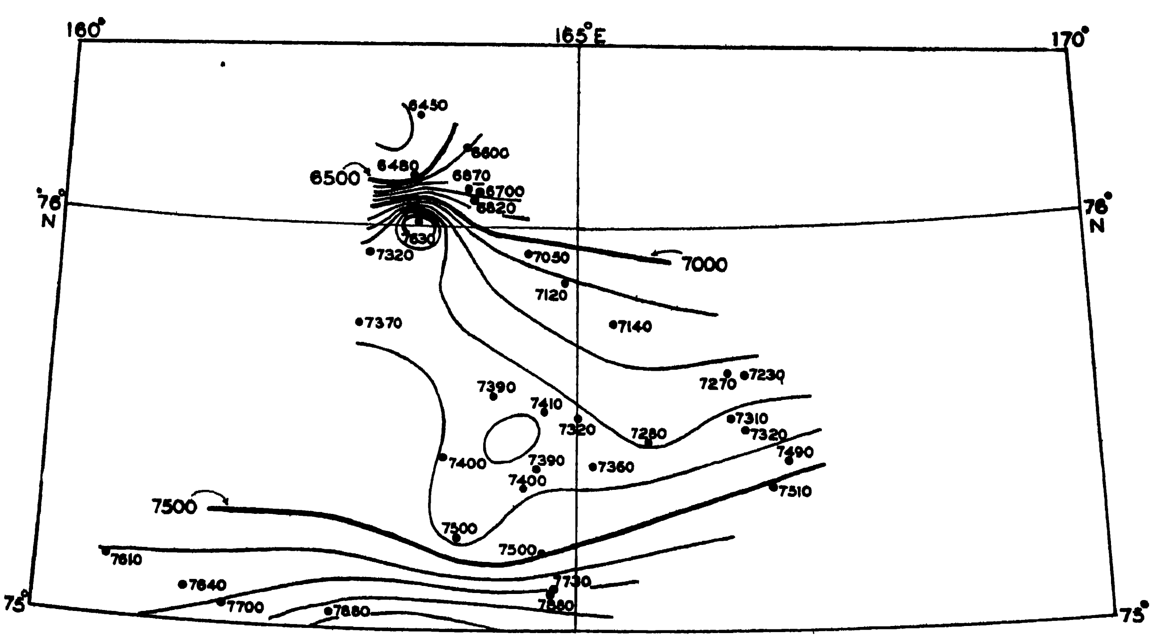


FIG 17—Magnetic horizontal-intensity to gammas (0 00001 C G S) and isodynamics, locally-disturbed region on Siberian shelf

Figures 16 to 18 have been prepared in order to show that the disturbed course of the isomagnetic lines in about 76° north latitude and 165° east longitude is substantiated by a great number of observations In these figures are entered the observed values, corrected for secular change in the case of declination The isogonics are drawn for intervals of 1°, the lines of horizontal intensity for intervals of 100 γ, and the lines of inclination for intervals of 10′ The observations are so numerous that the uncertainty as to the course of the lines is not great The disturbed character of the region is evident from the lines for all three elements, thus leaving no doubt as to the reality of this feature.

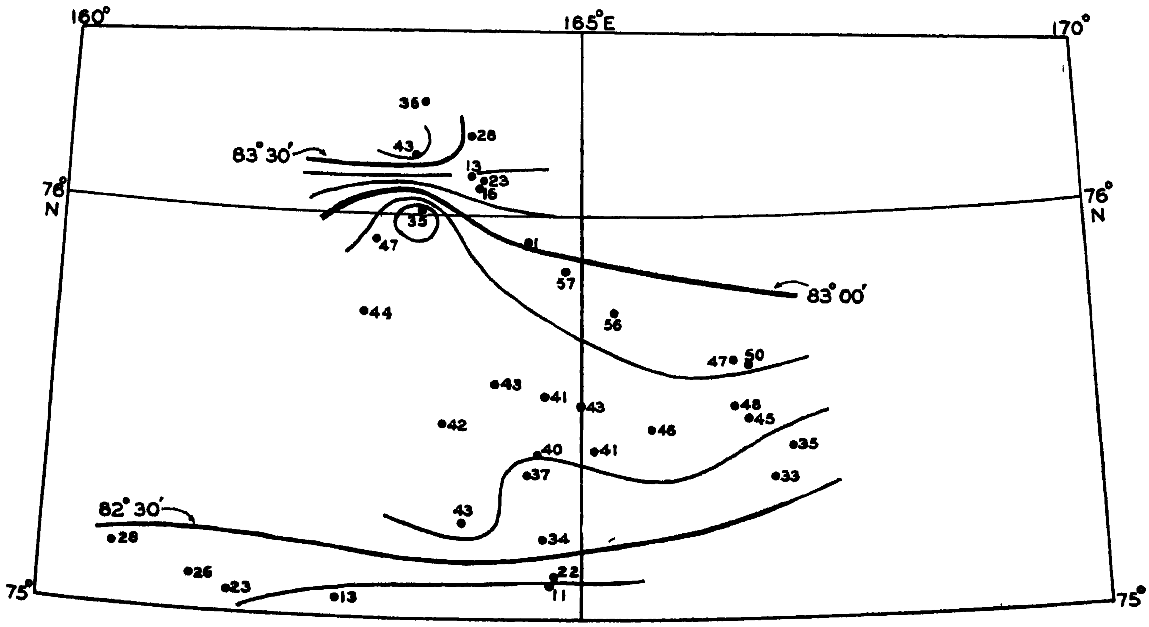


FIG 18—Magnetic inclination and isoclinics, locally-disturbed region on Siberian shelf

SECULAR-VARIATION DATA

After the present report was completed, there was received a Russian publication,[4] containing data of great importance The publication, issued by the Commission for the Exploration of the Republic Yakutsk, communicates the hourly observations of the declination made by the Russian Polar Expedition of E v Toll during the winters of 1900 to 1901 and 1901 to 1902 and the absolute magnetic observations of this and some other Russian expeditions It contains also a highly valuable summary of all magnetic observations which have been made in the Republic Yakutsk, beginning with those of the Great Northern Expedition of 1736 and ending with the observations of the *Maud* Expedition in 1920 and of N Evgenov in 1921 By means of the last compilation it is possible to determine the secular change of the declination within two regions which are represented on the isogonic chart in Figure 13, namely, the regions of the New Siberian Islands and between Kolyma River and Ayon Island Very few of the stations are exact reoccupations of old stations, but combinations of neighboring stations give concordant results Three station-pairs in the region of the New Siberian Islands give, as indicated in Table 15,[5] an annual secular-change of −8′1, while eight station-pairs in the Kolyma-Ayon district yield −8′4, both in the 90 years from 1820 to 1910 These values are

[4] Travaux de la Commission pour l'étude de la republique autonome soviétique socialiste Yakoute, Tome II, E W STELLING, D A SMIRNOV, N V ROSÉ Recueil d'observations magnétiques, faites en Yakoutie Leningrad, 1926

[5] The station numbers are as given in tabulation in report per footnote 1

larger than the value of −6′ per year, which was used above in order to reduce to epoch 1925.0 the observations which on the Russian charts were referred to epoch 1911.0. This circumstance is, however, of small importance to the isogonic chart, because the reduced observations agree very well. The period for which the corrections are applied (14 years), is so short that an error of 2′ in the secular change has small influence only on the course of the isogonics. A matter of greater importance is that the value given for the declination at Seal Bay, Kotelnoj, Station 1,[4] evidently refers to epoch 1902.0 and not, as stated on the charts from which it was taken, to epoch 1911.0. The value for 1925.0, therefore, should have been more than 1° lower than the value used in the isogonic chart, but even this circumstance would not change materially the isogonics over the New Siberian Islands.

TABLE 14a—*Secular Change of Magnetic Declination in the Regions of the New Siberian Islands (1822–1912) and of the Kolyma-Ayon District (1821–1925)*

Region	Station No	Lat north	Long east	Observer	Year	Declination	Average annual change
		° ′	° ′			° ′	′
New Siberian Islands	66	73 55	136 16	Anjou	1822	12 09 E	−8.8
	66	73 54	136 08	Neupokoev	1912	1 03 W	
	76	72 00	139 59	Anjou	1822	6 38 E	−7.7
	79	71 52	140 30	Skvortsov	1909	4 31 W	
	84	72 31	141 22	Anjou	1822	8 07 E	−7.7
	84	72 31	141 22	Skvortsov	1909	3 09 W	
Mean average annual change for region of the New Siberian Islands							−8.1
Kolyma-Ayon District	93	70 42	162 08	Wrangell	1821	14 06 E	−8.2
	94	70 42	162 02	Sverdrup	1925	0 12 W	
	106	70 03	170 36	Wrangell	1823	18 03 E	−8.3
	106	70 05	170 36	Sakharov	1911	5 48 E	
	147	68 42	160 51	Wrangell	1821	12 30 E	−8.9
	149	68 32	160 57	Selov	1909	0 32 W	
	151	68 57	161 15	Wrangell	1822	12 30 E	−8.6
	152	68 47	161 18	Selov	1909	0 01 W	
	153	69 31	161 43	Wrangell	1822	13 30 E	−8.6
	154	69 34	161 54	Selov	1909	1 02 E	
	163	69 38	162 48	Wrangell	1822	12 05 E	−7.5
	167	69 41	162 23	Selov	1909	1 15 E	
	176	68 37	165 12	Wrangell	1822	14 00 E	−7.8
	177	68 34	165 56	Amundsen	1920	1 13 E	
	185	69 10	167 18	Weber	1909	3 42 E	−6.9[a]
	184	69 01	167 04	Amundsen	1920	2 26 E	
	186	69 43	167 30	Wrangell	1821	18 30 E	−9.1
	188	69 51	167 57	Amundsen	1920	3 26 E	
Mean average annual change for region of the Kolyma-Ayon District							−8.4

[a] Omitted in the mean value

DESCRIPTIONS OF STATIONS

The stations occupied in the drift-ice naturally can not be described. The same applies to the stations at winter-quarters 1924 to 1925, which were located on the ice five miles off Four Pillar Island (see Fig. 12). There remain for description only station 54, Kain-ge-skon, Siberia, and 55 at Deering, Alaska. Station 54 (Kain-ge-skon) is a close

reoccupation of stations 22 and 42 of the Expedition It is located six meters west of the large whalebone, mentioned in the descriptions of stations 22 and 42, because natives had placed their tents on the locations previously occupied. Station 55 (Deering) is about 1 2 km from Deering, on the southern shore of Kotzebue Sound, Alaska, to the westward of a small wooden shed, used for storing powder and called "the powder-house" Station 55 was occupied, 43 meters true 85° northwest of the southeastern corner of the powder-house The location can also be found by walking 35 meters toward the northwest from the house, following the grass-covered ridge on which the house is built, then turning at right-angles to the left and proceeding 25 meters The location was not marked, because the ground was frozen and no permanent mark could be driven into it

Part III—RESULTS OF PHOTOGRAPHIC RECORDS OF DECLINATION AT CAPE CHELYUSKIN AND AT FOUR PILLAR ISLAND

By H U Sverdrup

Records of Declination at Cape Chelyuskin, October 1918 to August 1919

(1) INSTRUMENTS AND OBSERVATORY

Continuous registrations of the magnetic elements, as already stated, were not included in the program of the scientific work of the Expedition, as such registrations could not be carried out successfully on the drifting ice because the movement of the ice would make a permanent orientation of the instruments impossible The Expedition, however, in 1913 had procured a small photographic recording-declinograph of the "Arctic" type made by Max Toepfer and Son, Potsdam, and this instrument was taken along in the expectation that it might be used if the Expedition should have to establish winter-quarters on the coast The distance between magnet and recording drum, both of which were mounted on a solid brass bar, was of the order of 600 mm The circumference of the drum was 300 mm and the clock was regulated to make 1 hour correspond to 11 8 mm of record The width of the recording paper was 98 mm The magnet was suspended by a very heavy quartz fiber

Following the northern coast of Siberia toward the east, the progress of the Expedition was stopped by the ice September 13, 1918, 25 miles east of Cape Chelyuskin, where the vessel froze in and where the Expedition was obliged to spend one year, the vessel being released September 12, 1919 Shortly after the arrival at the place selected for winter-quarters, a magnetic observatory was built on shore of driftwood logs and planks. Attached to and with entrance from the observatory a long, low building was constructed, and the photographic declinograph was mounted in the end farthest from the observatory The whole building was buried in snow, so that the temperature did not fall below −20° centigrade in the registration room. In spite of this, it was not possible at first to make the clock which drives the drum work properly, but this difficulty was practically overcome by removing all oil by means of a benzine bath and applying a small quantity of kerosene as a lubricant

The instrument was mounted October 3, 1918, and taken on board preparatory to proceeding, August 9, 1919 The records, however, are not complete for this whole period, partly on account of the difficulties in making the clock run and partly because some records were spoiled by formation of frost or by light entering the recording room after the snow had melted in the summer

In attending to the instrument, the writer was assisted by Captain Helmer Hanssen, P Knudsen, and G Olonkin The greater part of the absolute observations of the declination for determining the base-line was taken by Captain Roald Amundsen

The records were not scaled in the field, they were only developed and the times of beginning and ending and of occasional breaks, as well as proper remarks, were entered. In the fall of 1919, when the Expedition proceeded to the east, the records were packed in a water-tight parcel addressed to the Director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, and, together with other scientific records, were intrusted to two men who were to carry them to the Russian wireless station at Port Dickson, about 600 miles southwest of Cape Chelyuskin, for despatching thence to their final destination The journey to be undertaken by these two men did not seem more hazardous than that the *Maud* was to undertake, but they did not reach their goal Three years later, in 1922, the body of one of the men was found by a

Russian expedition, which also found the parcel containing the magnetic records These were forwarded to the Director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, who received them March 31, 1923

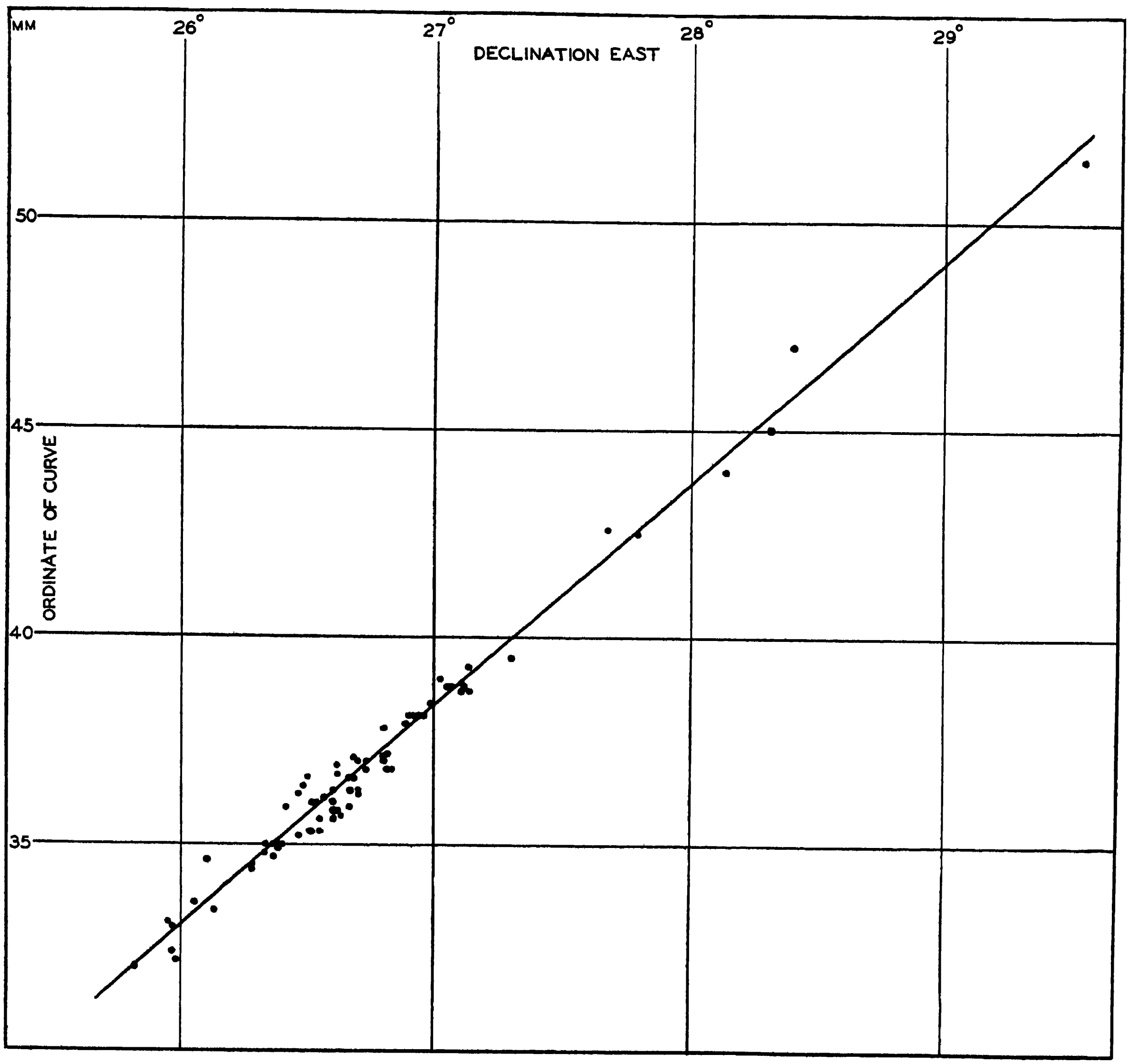


FIG 19—Control of scale-values for declination variometer at Cape Chelyuskin

(2) DECLINATION SCALE-VALUE

In 1918 the writer had had no experience in the registration of magnetic elements, and for this reason the important determination of the coefficient of torsion of the quartz fiber used in the declinograph for suspending the magnet was neglected Before scaling the records the scale-value, therefore, had to be determined by means of the base-line observations Fortunately, the recording instrument remained unchanged during a period of five months, in which a large number of absolute determinations of the declination were carried out, ranging between 25° 49′ and 29° 33′ These observations were utilized for determining the scale-value by means of the corresponding values of the ordinate of the curves and the absolute values of the declination A few of the values had

to be omitted, because the declination was changing so rapidly during the observation that the corresponding value of the ordinate of the curve could not be ascertained on account of the uncertainty introduced by the small time-scale of the record There remained 77 values which are represented graphically in Figure 19 In this figure the straight line was computed by means of least squares to fit the values, it is to be noted that this line agrees very well with the observed quantities The agreement is very satisfactory, considering the ragged appearance of the magnetograms and the uncertainty as to simultaneity introduced by the small time-scale From this line it is found that 1 mm $=11'18$ This value has been adopted as the scale-value

It is possible to obtain a rough check of this value by means of determinations of the torsion of the quartz fiber, which were carried out in November 1924 at Four Pillar Island

At this station we found $\frac{f}{f-h}=1\ 622$

Considering that the horizontal intensity at this station was 0.1084 c g s , while at Cape Chelyuskin it was only 0 0455 c g s , we find at the latter station as an approximate value

$$\frac{f}{f-h}=1.622\times\frac{1084}{455}=3\ 864$$

The distance from the lens to the sensitized paper at Cape Chelyuskin was 596 mm The distance R which enters in the usual formula for the scale-value

$$\epsilon_d=\frac{\cot 1'}{2R}\left(\frac{f}{f-h}\right)$$

is, according to H. M. W Edmonds,[1]

$$R=D-\frac{m}{3}-\frac{l}{3}-\frac{c}{3}$$

where D = distance from back of lens to magnetogram, and m, l, and c are thicknesses of movable mirror, lens, and cylindrical lens, respectively Since our distance, 596 mm , was measured from the front of the lens to the magnetogram, we may regard that as equal to the distance R, neglecting the small difference between the quantities l and $\left(\frac{l}{3}+\frac{m}{3}+\frac{c}{3}\right)$ We therefore find

$$\epsilon_d=\frac{3437\ 75}{1192}\times 3\ 864=11'.14$$

in very close agreement with the adopted value

This low sensitivity was very well suited to the conditions at Cape Chelyuskin, where the diurnal range of the declination frequently exceeded 10°, corresponding to 67 mm on the records In two cases the light from the mirror went off the paper, but the extreme value in both cases could be extrapolated, because the curve had the form of a sharp peak

(3) BASE-LINE VALUES

An inspection of the observers' notes and of the declinograms shows that the base-line has been changed on several occasions It remained at first unaltered from October 3 to 28, but at the end of October the clock driving the drum had to be taken on board and cleaned, and when it finally could be replaced, November 4, the instrument was readjusted From November 4, 1918, to January 28, 1919, the adjustment remained unaltered, but on January 28 the base-line was slightly changed, because the instrument

[1] "Formula for scale-value determination of declination variometer," Year Book Carnegie Inst Wash No 22 (1923) p 252.

was jarred After this, no change took place until June 28 During the last period of the registration, from June 28 to August 9, under summer conditions, the thawing of the ground frequently threw the instrument out of level, necessitating readjustments, which led to changes in the base-line values

The absolute observations of declination are summarized in the Table of Results on pages 332 to 334 The number of observations is small during the months of October and November 1918, because Captain Amundsen, who had intended to take the magnetic observations, was prevented from doing so by a broken arm From December 1918 the number is very satisfactory

TABLE 15—*Declination Base-Line Values at Cape Chelyuskin*

Date	L M T	Base-line	
1918	h	°	′
Oct 5	10 8	20	11
5	15 8		29
18	11 0		11
18	18 1		41
26	11 1		20
Nov 5	11 8	19	48
Dec 2	12 4		37
3	10 4		42
3	16 2		44
4	16 8		28
5	10 0		44
5	15 1		40
6	10 2		39
6	16 4		41
9	12 0		37
9	16 9		56
16	9 8		38
16	12 4		36
17	9 7		36
17	12 5		30
18	9 8		35
18	12 5		32
19	9 7		44
19	12 4		30
20	9 7		39
20	12 4		35
23	9 8		47
23	15 7		38
23	15 9		45
23	16 1		53
23	16 3		42
1919			
Jan 15	10 5		40
15	10 7		43
17	9 2		52
20	10 6		37
21	9 8		40
23	9 9		43
24	10 2		41
24	12 6		39
Jan 28	9 8	19	47
28	12 3		43
29	10 1		44
29	12 4		45
31	9 8		53

Date	L M T	Base-line	
1919	h	°	′
Jan 31	12 2	19	53
Feb 1	10 3		48
3	11 9		51
6	10 0		61
6	10 2		59
7	10 2		57
12	10 0		57
12	12 7		55
20	17 6		41
27	14 9		49
27	17 9		53
Mar 11	9 7		55
11	12 8		52
20	9 7		59
24	10 2		58
24	12 7		61
27	14 6		57
27	17 2		54
Apr 4	14 3		49
4	17 0		53
7	14 7		49
7	17 4		60
9	14 9		53
9	17 5		58
11	14 7		55
11	17 0		54
14	14 5		60
14	16 4		58
16	14 7		61
16	17 0		53
18	15 0		60
18	17 2		57
21	15 0		55
21	17 2		61
24	14 7		57
24	16 9		55
28	9 8		56
28	12 1		56
May 2	9 9		41
5	10 1		50
7	9 7		51
7	12 5		51
9	9 7		56
9	11 9		58
12	9 8		52
12	11 9		53

Date	L M T	Base-line	
1919	h	°	′
May 14	9 8	19	47
16	10 1		54
16	12 2		46
19	10 0		50
23	9 8		51
23	11 9		56
28	9 8		53
28	12 3		54
30	9 8		53
30	12 0		53
Jun 3	9 7		56
3	12 2		58
6	9 8		52
6	11 9		52
10	9 9		59
10	12 3		56
13	13 0		59
17	9 5		59
17	11 6		58
20	9 7		52
20	11 8		51
24	9 8		56
27	10 0		52
27	12 2		48
Jul 11	10 0	19	46
11	12 2		45
12	9 8		48
12	12 0		48
Jul 15	14 8	11	48
15	17 0		45
17	14 8		43
17	17 0		43
18	14 9		39
19	9 4		56
19	11 5		54
Jul 21	14 3	16	27
21	16 5		31
22	14 6		31
25	9 9		32
Jul 31	14 5	16	39
31	16 9		44
Aug 6	14 9		32
6	17 0		34

The base-line values, which are computed by means of these absolute observations, have been compiled in Table 15, where horizontal lines indicate that changes of the base-line value have taken place It will be noted that the base-line values are entered to the nearest minute. The minutes are, however, always uncertain within two or three units

and occasionally eight to ten units, because the ordinates could not be read with a higher accuracy than 0 2 to 0 3 mm , corresponding to two or three minutes of arc, and because the small time-scale made it difficult to determine exactly the simultaneous value of the ordinate of the curve corresponding to the observed declination, and when the declination was changing rapidly a small uncertainty in the time would introduce large errors In Table 16 the periods during which the base-line remained unchanged and the adopted base-line values are shown These adopted values, which are the mean of the observed values for each period, are given to the nearest minute, because the values can scarcely be regarded as having a higher degree of accuracy Using values computed to 0 1 minute in the present case would introduce an imaginary accuracy only

TABLE 16—*Adopted Base-line Values at Cape Chelyuskin*

Period				Adopted base-line
From		To		
Date	L M T	Date	L M T	
	h		h	° ′
Oct 3, 1918	12	Oct 28, 1918	24	20 22
Nov 4, 1918	16	Jan 28, 1919	9	19 40
Jan 28, 1919	9	Jul 1, 1919	9	19 54
Jul 8, 1919	17	Jul 15, 1919	9	19 47
Jul 15, 1919	9	Jul 21, 1919	9	11 47
Jul 21, 1919	9	Jul 29, 1919	11	16 30
Jul 29, 1919	11	Aug 9, 1919	9	16 37

(4) HOURLY VALUES OF THE DECLINATION

The instrument was not provided with means for supplying hourly time-marks, but the times when the slit of the lamp was uncovered after a new paper had been placed on the drum and the times when the slit was covered before the paper was changed, were noted and occasionally a time-mark was made in the middle of the record by covering the slit of the lamp for a few minutes By taking into consideration the times of beginning and ending, it was ascertained that the clock kept a fairly constant rate from day to day and the occasional time-marks served as a check on the rate of the clock during 24 hours The rate was found to be so constant that the interval from the times of beginning and ending to the nearest full hours could be computed, assuming one hour of time to correspond to 11 8 mm The nearest full hours were then marked on the base-line, and by dividing the space between them in equidistant intervals every hour was marked Vertical hour-lines from these marks divided the curves into the proper number of intervals For each hourly interval the mean ordinate was read by a glass scale so adjusted that the areas bounded by the trace above and below the line of the glass scale were equal These mean ordinates thus were centered on the half-hours The adjustment to equal areas frequently could not be made with accuracy greater than 0 5 mm in cases when the mean ordinate, on account of the ragged appearance of the curve and the reading of the mean ordinate, was not accurate to more than 0 2 to 0 3 mm The mean hourly declinations, therefore, when the curve is smooth, have an uncertainty of 2 to 3 minutes of arc, and when the conditions are very disturbed the uncertainty may reach 10 minutes of arc

Table 17 contains the mean hourly values of the declination centered on the half-hours as derived from the declinograms The time used is L M T The longitude of the station is 105° 40′ east of Greenwich, corresponding to a time-difference from Greenwich

of $7^h\ 02^m\ 40^s$ Neglecting the small difference of $2^m\ 40^s$, the tables may be regarded as giving the mean hourly values of declination referred to G M T. by subtracting 7 hours from the time as expressed in L M T

No special remarks are given to explain the vacant spaces in the tables These are due to the clock having stopped, to the record having faded out on account of frost forming on the lenses, or to the records having been spoiled by light entering through cracks in the primitive observatory

The mean values at the right or at the bottom of the tables are derived from the days on which complete values for 24 hours have been available The mean values are given to the nearest minute only because of the errors of single values and, still more, because of the uncertainty of the base-line values

(5) MEAN MONTHLY VALUES OF DECLINATION

In Table 18 the mean monthly values of the declination are compiled The left part of the table contains the mean declinations derived from all days and from the days in each month which have been given the character-numbers 0, 1, and 2, while the number of days are given in the right part From this part of the table it is seen that only the months of February and March are complete For the other months the number of days is sufficient to give fairly reliable values of the declination, except for August, which is represented by 6 days at the beginning of the month only The absolute values for the months October, July, and August are, however, less accurate than the others, because the adopted base-line values for these months depend upon a small number of determinations

The whole series is too short to permit any definite conclusions regarding annual variation of the declination A glance at the second column of Table 18 shows that the declination is greater in winter than in summer, but if only the months November to June, for which the values are most reliable, are considered, this difference practically disappears The only conclusion which seems justified is that no conspicuous annual variation is found

The series is also far too short to give any information regarding the secular change in declination, and no observations have been made previously at this station from which the secular change can be derived It is, however, not likely that the secular change at Cape Chelyuskin is large, because the region to the west has *increasing*, while the region to the east has *decreasing*, easterly declination To the west of Cape Chelyuskin the secular variation has been determined at Teplitz Bay in Franz Josef Land (81° 47′5 N, 57° 59′ E), where W J Peters and J A Fleming[2] found an annual increase of 7′5 in the period 1900 to 1904, and at Port Dickson (73° 30′ N, 80° 26′ E), where, according to the results of the *Maud* Expedition (see p 339), the increase from 1878 to 1918 amounted to 3′4 per year To the east the secular change has been determined at Pitlekai (67° 06′ N, 186° 29′ E), where a decrease of 6′6 per year from 1879 to 1921 was found (see p 339) The distance from Cape Chelyuskin to Pitlekai is, however, very large, but according to recent maps issued by the Russian Hydrographic Office and confirmed by the observations of the *Maud* Expedition, the secular variation of declination is −6′ to −8′ per year also in the region of the New Siberian Islands, which are about as far east of Cape Chelyuskin as Franz Josef Land is west It is, therefore, probable that the secular variation is small at Cape Chelyuskin

The mean value of the declination, derived directly from all days or from the weighted monthly means, is *26° 49′ east for epoch 1919 2*

The grouping of the mean daily values of the declination according to the magnetic character of the day brings out the fact that the declination has the greatest east value

[2] The Ziegler Polar Expedition, 1903–1905, Scientific Results, p 305

TABLE 17—*Hourly Values of Declination at Cape Chelyuskin,*

[26° East Plus Tabular Quantities]

Day	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h	13^h–14^h	14^h–15^h
1918	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Oct 3													[12	15	20
4	84	29	73	84	109	138	163	110	30	49	71	40	15	5	26
5	29	51	138	116	122	120	54	51	51	45	49	43	48	42	29
6	49	80	71	107	127	118	137	137	51	29	46	42	42	51	29
7	40	71	93	85	106	127	108	98	32	18	39	51	49	41	40
8	[96	83	72	95	121	92	60	56	55]						
13									[65	62	61	59	52	40	46
14	[60	76	96	66	60	61	59	55]							
15											[61	61	51	30	17
16	58	40	83	82	76	72	70	97	73	62	43	81	70	65	98
17	127	72	138	81	96	79	72	73	86	96	62	46	49	50	83
18	56	62	95	96	151	161	155	111	61	62	55	40	51	30	29
19	45	85	90	85	198	111	142	98	53	56	63	53	40	42	39
20	51	65	72	73	75	195	194	136	80	22	41	48	51	50	18
21	62	63	105	98	96	96	140	169	106	49	51	49	50	41	30
22	80	53	62	103	118	107	95	85	85	68	46	39	29	29	38
23	73	93	80	83	88	96	140	68	58	56	58	58	51	50	37
24	72	79	71	96	106	135	142	138	49	42	51	29	30	12	40
25	51	53	62	125	119	85	94	128	118	72	60	50	50	51	48
26											[51	50	50	47	41
27	49	82	68	51	58	68	63	59	61	61	61	60	56	51	50
28	51	53	50	62	78	101	79	71	55	51	51	51	50	51	42
Mean	61	64	84	89	103	113	116	102	66	52	53	49	46	41	42
1918															
Nov 4															
5	41	47	54	54	90	176	194	58	37	41	43	41	37	37	31
6	44	44	49	51	56	65	55	43	43	47	47	43	43	41	41
7	[39	51	54	51	51	51	51	51	50]						
9													[39	40	41
10	51	51	54	63	96	109	74	44	46	40	35	37	35	31	30
11	4	38	48	118	143	176	186	118	87	45	24	11	− 3	7	31
12	157	98	132	199	145	154	105	105	63	− 13	9	22	30	9	18
13	84	163	94	165	94	129	87	29	20	(26)	(37)	(48)	54	54	96
14	59	265	20	40	43	40	44	20	15	20	31	37	40	43	40
15	33	1	120	108	170	74	139	109	38	37	16	34	38	20	18
16	176	71	109	78	98	160	194	93	51	40	41	9	11	29	46
17	70	66	98	110	115	118	98	76	60	29	29	31	30	30	34
18	74	88	65	60	64	64	66	54	44	40	34	33	30	30	30
19	40	46	79	85	66	51	54	85	51	43	30	19	30	24	36
20												[29	35	30	39
21	50	33	50	54	50	49	47	45	43	43	43	41	40	39	37
22	97	54	71	104	66	76	50	48	49	37	36	36	33	39	40
23	41	48	51	40	134	222	174	120	85	85	65	75	65	81	47
24	29	39	73	85	113	85	64	56	66	50	51	44	33	31	31
25	54	125	108	109	78	63	70	66	40	31	38	31	35	37	39
26	85	65	55	56	78	54	45	47	54	51	45	43	40	30	43
27	40	40	59	48	65	104	122	63	59	49	43	31	30	40	39
28	38	54	54	51	53	54	54	50	43	43	41	41	40	39	41
29	40	51	58	68	54	132	118	54	41	43	43	41	41	37	36
30	[41	127	85	65						43	29	38	31	33	37
Mean	62	71	71	83	89	103	97	66	49	39	37	36	35	35	38
1918															
Dec 1	9	108	89	84	124	124	109	81	[61	41]	21	30	31	31	28
2	50	85	150	109	317	220	189	98	28	31	33	34	35	39	38
3	43	43	59	75	87	54	45	43	41	40	46	43	36	30	58
4	[64	57	74]							[31	35	40	31	37	26
5	[34	57	65	54	104]					[40	40	40	39	38	40
6	44	44	46	46	48	43	49	46	45	43	43	41	43	43	43
7	33	33	51	57	45	47	37	43	44	43	40	31	39	40	31
8	18	107	120	97	167	183	120	134	128	67	39	29	54	48	94
9	108	78	85	76	87	176	185	104	48	51	40	30	34	28	20
15											[31	30	34	38	36
16	40	63	55	56	53	65	43	44	48	43	40	40	35	37	35
17	68	66	119	109	135	118	51	43	41	45	40	39	34	31	34
18	38	105	94	91	113	98	43	58	43	37	40	53	40	39	41
19	31	90	67	65	74	119	154	132	95	54	31	29	30	31	28
20	55	6	43	143	120	98	83	43	61	76	34	31	24	28	30
21	8	60	90	85	95	179	150	63	53	39	35	31	38	30	21
22	46	118	106	79	87	81	79	77	50	45	18	20	0	24	33
23	19	29	40	99	128	128	150	138	140	91	35	20	7	31	11
24	− 29	73	74	38	71	118	145	99	31	31	33	33	31	29	27
25	28	71	57	57	76	86	79	55	43	36	38	40	37	29	20
26	87	31	98	134	210	265	110	108	38	65	44	34	13	43	40
27	86	70	76	97	263	288	139	105	107	61	51	44	44	44	40
28	41	49	54	54	49	46	46	45	44	44	45	44	44	43	45
29	48	48	43	44	63	48	55	50	45	44	44	43	43	41	38
30	60	50	55	51	44	47	44	44	44	43	40	40	41	43	44
31	44	45	51	60	74	78	76	46	37	34	31	33	37	35	37
Mean	42	64	75	79	110	118	95	74	57	48	37	35	33	36	36

( )=Interpolated [ ]=Not used in the mean

October 3, 1918, to August 9, 1919

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Magnetic character	Mean	Maximum		Minimum		Range
1918	′	′	′	′	′	′	′	′	′		′	h m	′	h m	′	′
Oct 3	4	26	29	29	37	41	26	51	− 16]							
4	19	15	33	39	37	39	40	49	20	2	55	6 58	283	1 04	− 44	327
5	30	31	18	27	38	19	28	40	27	2	52	5 30	212	0 43	− 66	278
6	49	42	38	29	42	40	40	49	49	1	62	6 18	236	2 30	26	210
7	42	38	39	36	71	36	7	39	61	1	57	5 43	174	21 16	− 12	186
8																
13	45	50	50	49	45	51	51	82	49]							
14																
15	25	43	− 4	6	− 27	− 47	7	78	51]							
16	39	− 22	− 4	− 41	40	− 80	− 36	76	41	2	45	19 15	464	19 31	−146	610
17	37	38	61	19	43	25	− 82	69	123	2	64	23 10	530	21 41	−186	716
18	29	30	38	38	7	21	− 10	40	49	2	61	21 08	514	21 51	−119	633
19	35	51	47	43	50	4	85	7	48	2	62	21 44	541	22 36	− 87	628
20	28	50	48	18	43	40	30	7	85	1	64	6 00	385	22 35	−156	541
21	50	41	43	47	47	58	− 10	19	29	1	64	6 55	263	21 32	− 61	324
22	40	37	20	103	42	39	59	50	69	1	62	18 19	230	17 01	+ 1	229
23	40	50	27	18	57	− 49	− 4	21	35	1	54	6 42	175	20 10	−208	383
24	30	42	7	29	4	− 9	4	30	50	1	53	6 03	182	20 40	−139	321
25	42	40	29	12	40	40	29	22	30	1	60	3 57	230	18 19	− 17	247
26	51	51	50	51	48	40	49	37	51]							
27	50	51	50	50	50	49	43	41	29	0	55	1 55	116	23 02	− 4	120
28	41	40	40	15	− 16	− 49	101	57	57	1	49	21 32	292	20 04	−205	497
Mean	38	36	33	30	37	14	21	38	50		57 4		302		− 89	391
1918																
Nov 4		[37	38	39	40	41	41	36	40]							
5	30	35	35	37	31	30	40	41	43	1	55	5 58	295	15 38	25	270
6	41	43	43	43	41	38	21	39	30	0	44	22 15	152	22 29	− 44	196
7																
9	40	40	31	31	39	34	31	40	87]							
10	31	23	26	23	17	− 2	− 15	4	18	0	38	21 14	165	21 02	−104	269
11	84	59	43	28	18	7	− 16	− 6	7	2	52	21 00	441	20 51	−138	579
12	56	123	33	74	29	− 5	− 66	7	51	2	64	2 57	410	21 38	−216	626
13	109	137	98	96	112	31	− 38	85	43	2	77	3 09	162	21 48	−149	311
14	21	18	63	89	30	19	14	40	48	2	46	1 38	474	20 02	− 32	506
15	43	45	31	30	25	87	193	− 7	7	2	59	4 08	330	23 58	−186	516
16	54	40	56	41	98	67	18	− 2	− 27	2	65	0 14	422	0 02	−180	602
17	45	40	45	67	− 76	− 13	− 7	− 6	9	1	46	18 55	210	19 56	−169	379
18	17	1	40	27	18	5	− 22	− 2	0	1	36	20 30	143	20 57	− 84	227
19	40	30	31	31	20	7	68	− 22	51	1	42	21 34	180	22 04	− 66	246
20	28	34	30	29	31	33	33	37	43]							
21	39	37	31	20	28	29	7	37	76	1	40	20 07	230	21 19	− 40	270
22	39	41	43	43	41	39	37	35	44	0	50	3 01	173	22 35	20	153
23	54	75	20	− 46	− 35	− 35	− 46	18	− 1	1	56	5 15	328	20 11	−115	443
24	20	50	51	9	9	− 12	7	23	23	2	43	22 08	354	22 28	− 74	428
25	40	43	43	43	43	41	40	43	63	1	55	23 59	321	11 40	6	315
26	44	41	13	14	38	40	46	55	18	1	49	0 14	155	23 39	− 13	168
27	40	10	11	43	43	57	51	30	43	0	51	6 19	143	21 38	− 24	167
28	13	38	31	29	54	54	− 5	19	43	1	42	20 25	261	20 03	− 55	316
29	30	41	40	31	36	30	20	40	41	0	49	6 02	208	21 41	16	192
30	40	41	13	54	31	65	97	65	− 7	1		6 09	427	23 08	− 58	485
Mean	44	48	42	38	30	25	17	22	30		50 3		265		− 77	342
1918																
Dec 1	43	64	29	37	−59	− 38	− 22	78	118	2	51	22 46	291	19 56	−167	458
2	45	13	14	41	39	43	43	50	51	2	77	4 43	507	0 23	− 4	511
3	85	63	99	9	10	30	9	− 2	49	1	46	17 42	150	18 55	− 35	185
4	29	31	34	59	30	19	84	58	− 15]							
5	43	41	41	41	43	44	43	43	44]							
6	43	43	43	43	41	41	41	39	33	0	43	4 00	51	23 45	30	21
7	41	20	31	31	29	38	28	87	29	1	40	22 31	174	23 21	− 25	199
8	43	6	− 13	−24	87	− 38	0	5	7	1	62	5 11	330	20 25	−136	466
9	59	187	107	31	51	97	16	8	− 46	2	69	17 14	293	23 32	−102	395
15	37	31	26	31	40	14	1	− 11	7]							
16	43	41	43	41	33	41	87	− 6	28	1	41	21 26	165	22 19	−114	279
17	39	46	28	31	43	54	25	30	18	1	54	23 22	243	22 58	− 95	338
18	29	17	35	30	31	31	36	40	39	1	51	5 07	150	16 56	0	150
19	48	75	43	20	54	− 22	120	20	10	2	58	21 02	332	20 44	− 52	384
20	33	40	33	41	41	28	40	18	112	2	53	23 37	562	1 32	− 54	616
21	29	46	43	28	50	40	24	− 12	23	1	52	5 22	296	22 20	− 81	377
22	40	30	33	35	30	39	35	31	24	1	49	1 38	299	9 51	− 44	343
23	24	65	100	49	65	38	33	9	− 69	2	58	16 52	238	23 10	−158	396
24	33	40	28	31	18	28	− 4	30	40	1	44	1 33	211	0 27	−110	321
25	1	9	36	29	41	7	274	64	− 49	2	49	21 07	612	23 54	− 84	696
26	33	31	57	54	140	96	34	24	25	2	76	5 05	489	0 03	− 69	558
27	41	44	46	48	48	50	43	31	30	2	79	5 17	536	1 50	− 36	572
28	46	45	44	41	47	54	47	46	46	0	46	3 06	63	15 08	37	26
29	40	36	40	53	45	44	30	40	54	0	45	23 21	85	21 12	8	77
30	43	44	43	41	43	43	43	43	43	0	45	0 19	88	22 49	38	50
31	40	31	29	21	15	30	− 3	34	34	1	40	20 18	216	21 05	− 44	260

TABLE 17—*Hourly Values of Declination at Cape Chelyuskin,*

[26° East Plus Tabular Quantities]

Day	0h–1h	1h–2h	2h–3h	3h–4h	4h–5h	5h–6h	6h–7h	7h–8h	8h–9h	9h–10h	10h–11h	11h–12h	12h–13h	13h–14h	14h–15h
1919	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan 1	78	49	81	96	95	44	38	43	36	31	33	29	31	28	29
2	75	45	55	67	60	54	28	38	39	34	36	33	35	31	40
3	[43	46	44	47	45	44	43	43	41]						
4											[51	29	34	39	28
5	84	35	140	174	93	105	199	154	48	78	30	9	28	30	30
6	50	35	51	87	98	160	208	85	90	21	17	20	28	36	35
7	39	51	7[illegible]	107	129	153	68	67	28	31	20	24	23	28	35
8	17	60	70	76	84	71	75	94	63	25	15	17	21	36	35
9	95	60	56	58	87	83	115	118	84	30	30	28	31	39	33
10	37	63	74	69	54	53	54	45	39	39	41	41	41	40	41
11	34	64	65	65	97	76	43	40	41	38	39	40	40	41	41
12	40	49	50	50	56	59	59	59	47	36	36	37	40	35	33
13	51	80	73	51	37	41	37	38	51	20	13	23	20	− 13	19
14	− 10	− 4	21	31	43	56	64	54	60	41	31	48	44	60	30
15	33	65	71	66	53	43	44	41	41	41	44	44	39	26	18
16	39	45	56	74	76	124	84	41	54	39	35	30	27	33	33
17	223	14	53	86	114	99	83	66	69	78	109	20	8	13	23
18	[43	56	83	80	95	165	127	63	136	81]					
19												[28	8	18	19
20	− 16	− 25	39	71	107	137	100	65	44	25	18	24	19	33	29
21	29	8	54	85	76	125	134	128	71	60	44	18	25	17	9
22	37	55	41	44	93	87	85	120	70	30	29	19	31	25	23
23	58	54	94	90	97	85	123	87	65	41	31	17	17	20	24
24	24	19	63	70	61	73	46	40	41	39	37	31	31	31	20
25	28	45	50	57	60	70	107	63	65	47	28	18	24	23	29
26	28	38	50	57	61	51	49	48	44	38	34	33	31	35	36
27	26	45	50	51	46	43	54	43	41	41	38	33	30	29	20
28	45	47	49	69	79	67	63	54	48	45	41	42	38	35	41
29	44	45	52	121	153	109	94	112	97	68	32	34	34	27	24
30	[53	51	62	112	79	136	55	57	50]						
31										[61	42	31	27	24	32
Mean	48	42	61	75	80	83	82	70	55	41	34	28	29	30	30
1919															
Feb 1	83	81	134	107	123	98	99	101	75	59	35	34	34	10	23
2	43	33	79	71	91	85	81	109	62	34	37	40	38	34	37
3	− 10	40	65	126	100	132	156	78	65	50	23	32	37	41	33
4	− 90	0	52	90	79	76	142	70	39	45	10	7	23	36	43
5	−110	13	79	68	88	132	119	147	109	4	50	3	29	23	27
6	27	67	32	53	57	77	64	47	59	47	36	21	31	36	29
7	53	61	51	58	90	98	122	44	51	42	33	41	43	41	44
8	52	62	57	68	58	55	63	91	82	46	42	43	44	43	42
9	67	62	65	57	54	50	56	53	52	49	50	48	45	45	44
10	44	83	123	111	132	101	49	60	53	49	49	48	42	44	44
11	62	59	57	53	57	58	53	45	45	44	45	44	44	42	38
12	47	49	53	55	57	45	45	45	47	45	45	44	44	43	30
13	48	59	58	58	42	43	44	44	49	43	44	43	44	35	31
14	70	55	37	68	79	111	139	121	199	180	65	23	32	27	21
15	29	44	45	124	98	68	99	120	67	68	28	30	29	33	38
16	53	68	54	99	148	169	190	178	121	25	37	27	1	25	27
17	43	34	67	120	146	147	64	65	51	32	27	30	31	22	34
18	42	57	55	93	103	141	90	37	37	28	29	28	27	35	32
19	31	58	79	103	120	187	150	97	43	30	31	30	31	33	25
20	45	43	45	50	64	91	111	88	77	42	30	20	18	22	23
21	36	43	48	65	57	63	77	109	199	183	109	54	21	20	7
22	90	57	103	82	124	246	133	148	85	79	58	14	31	7	30
23	− 9	67	133	73	79	121	156	207	111	79	35	34	33	1	37
24	87	68	112	134	173	126	157	133	153	87	53	41	27	32	31
25	23	40	45	59	77	77	86	73	70	63	55	53	45	43	37
26	33	42	49	57	54	85	101	110	101	87	67	49	37	32	23
27	20	37	90	74	72	80	99	56	78	84	76	60	39	4	1
28	34	35	53	129	146	62	107	82	190	73	39	77	75	80	12
Mean	34	51	69	82	92	101	102	91	85	61	44	36	35	32	30

[ ] = Not used in the mean

October 3, 1918, to August 9, 1919—Continued

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Maximum		Minimum		Range
1919	′	′	′	′	′	′	′	′	′		′	h m	′	h m	′	′
Jan 1	36	40	28	29	34	34	37	35	56	1	45	0 32	202	17 57	16	186
2	40	41	31	34	33	35	41	43	43	1	42	0 08	174	19 43	26	148
3																
4	51	56	21	4	123	− 35	4	− 13	23]							
5	51	27	34	108	44	31	40	84	60	2	72	7 06	483	23 04	−279	762
6	27	76	57	51	87	− 24	77	38	18	2	60	19 40	505	20 21	−234	739
7	40	50	90	67	65	95	74	26	45	1	60	5 30	268	23 19	− 6	274
8	26	54	43	51	41	98	28	25	17	2	48	20 42	643	0 31	− 91	734
9	40	31	37	28	41	50	43	37	27	1	53	0 17	274	23 54	− 21	295
10	43	43	41	43	45	44	35	40	43	1	46	22 58	162	0 56	− 46	208
11	34	31	29	31	41	43	67	20	35	0	46	21 33	196	0 11	− 16	212
12	33	27	31	43	33	37	34	65	63	0	44	22 28	176	22 46	14	162
13	68	63	23	− 4	29	43	31	34	21	1	35	1 40	153	18 06	− 41	104
14	46	49	39	87	43	81	28	63	40	1	44	18 42	162	0 43	− 82	244
15	29	28	30	23	55	25	37	40	34	1	40	1 42	90	14 02	− 33	123
16	34	23	24	9	18	− 35	− 14	− 11	185	2	43	23 44	621	20 14	− 64	685
17	29	4	9	51	140	33	46	46	4	2	59	0 03	572	23 25	− 82	654
18																
19	8	34	44	29	20	172	54	− 12	21]							
20	24	40	38	35	14	43	116	10	126	2	47	23 43	615	1 43	−114	729
21	9	36	36	43	31	40	41	− 10	25	1	47	7 09	251	22 42	−115	366
22	31	33	43	26	41	31	30	29	33	1	45	4 03	178	8 48	− 72	250
23	26	18	28	23	44	44	40	31	73	1	51	0 30	254	0 41	− 54	308
24	31	31	34	36	20	31	− 1	3	28	1	35	1 42	240	1 05	− 95	335
25	25	28	26	33	40	39	43	34	31	0	42	6 12	126	23 58	6	120
26	34	35	35	37	40	43	39	39	45	0	41	4 32	84	23 03	23	61
27	29	28	28	28	28	31	30	29	30	0	36	4 45	84	19 42	20	64
28	33	34	22	32	35	29	14	34	33	0	43	22 16	164	22 03	− 45	209
29	22	22	21	30	21	35	44	44	45	1	55	3 50	235	17 14	7	228
30																
31	23	21	23	34	34	9	1	− 7	− 1]							
Mean	34	36	34	39	43	38	40	33	46		47 1		276		− 55	332
1919																
Feb 1	54	77	63	146	90	147	77	33	23	2	75	19 02	324	23 23	−130	454
2	35	51	63	46	− 10	131	74	32	62	2	57	23 38	353	23 59	−112	465
3	51	64	25	54	114	52	32	23	110	2	62	23 48	366	9 04	− 86	452
4	42	40	34	21	115	51	64	24	− 64	2	40	6 57	212	23 40	−350	562
5	43	43	35	37	79	111	53	− 17	− 12	2	48	21 05	333	0 09	−225	558
6	38	23	62	47	44	65	45	55	34	1	46	2 03	134	2 44	− 51	185
7	44	44	44	44	44	43	43	46	49	1	53	6 09	179	9 30	− 1	180
8	37	34	34	40	45	45	50	34	33	0	50	7 40	123	23 27	− 35	158
9	43	42	41	43	43	43	43	42	39	0	49	0 18	95	23 38	32	63
10	44	43	40	41	42	41	54	40	44	1	59	2 54	190	0 40	25	165
11	42	42	43	43	43	40	42	43	45	0	47	1 20	75	15 34	34	41
12	53	39	35	35	34	34	37	33	23	0	43	4 26	61	23 34	11	50
13	22	20	18	21	22	− 1	− 22	− 2	− 1	1	32	1 55	182	21 16	− 35	217
14	12	23	23	65	65	33	23	21	32	2	64	9 26	335	22 30	− 25	360
15	33	23	24	1	48	33	33	34	65	2	51	3 12	277	1 58	−157	434
16	29	29	65	31	57	43	54	58	12	2	67	19 50	391	23 31	−166	557
17	43	36	50	121	38	31	27	32	20	2	55	5 10	232	23 13	− 49	281
18	34	37	49	48	35	23	95	− 26	12	2	48	21 04	317	22 11	−177	494
19	34	37	43	43	42	42	42	37	40	1	59	5 09	246	1 00	− 24	270
20	21	22	22	37	11	25	13	23	23	0	40	22 55	171	21 46	− 12	183
21	31	32	25	190	34	− 11	− 1	− 12	43	2	59	18 39	547	22 27	− 74	621
22	12	22	25	23	21	12	31	63	− 11	2	62	5 37	390	23 30	−104	494
23	− 2	29	59	90	33	21	− 71	27	45	2	58	7 58	544	21 09	−303	847
24	33	34	44	38	41	38	40	38	48	2	74	4 40	390	12 55	11	379
25	41	44	45	45	45	42	34	37	38	0	51	6 38	93	0 03	− 8	101
26	33	35	22	34	24	45	3	24	33	1	49	20 42	157	21 12	− 64	221
27	18	2	− 7	23	33	42	43	43	42	1	46	2 31	177	17 22	− 36	213
28	14	34	48	83	22	12	2	− 1	13	2	59	8 49	466	8 20	− 77	543
Mean	33	36	38	53	45	44	34	28	30		53 6		263		− 78	341

[ ] = Not used in the mean

TABLE 17—*Hourly Values of Declination at Cape Chelyuskin,*

[26° East Plus Tabular Quantities]

Day	0h–1h	1h–2h	2h–3h	3h–4h	4h–5h	5h–6h	6h–7h	7h–8h	8h–9h	9h–10h	10h–11h	11h–12h	12h–13h	13h–14h	14h–15h
1919	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Mar 1	38	77	69	79	83	93	113	220	79	46	53	48	30	33	20
2	51	75	30	112	68	82	69	51	57	34	32	34	21	29	23
3	50	65	142	117	112	146	219	72	75	44	24	34	34	21	34
4	53	67	53	72	100	92	95	113	82	54	24	29	19	23	8
5	52	110	91	62	88	90	68	68	45	32	34	41	24	41	34
6	68	75	65	68	108	99	211	154	143	102	− 47	20	32	34	34
7	34	39	57	118	148	190	123	121	162	68	68	37	23	23	21
8	38	40	149	101	111	113	78	71	79	59	51	23	28	23	23
9	57	48	101	101	68	54	57	63	72	58	41	38	34	32	32
10	65	59	57	48	45	48	51	54	54	51	52	50	45	39	35
11	45	48	45	55	45	47	48	50	53	49	45	43	37	31	16
12	32	42	38	43	47	65	51	57	50	73	68	51	14	15	15
13	35	51	47	87	100	123	101	56	47	48	49	44	38	33	33
14	38	48	83	112	95	107	109	111	62	73	65	34	10	20	14
15	38	33	93	131	90	124	68	(62)	(54)	(42)	34	34	34	29	20
16	11	23	48	63	89	111	68	87	91	87	34	37	51	21	15
17	35	57	67	67	93	90	149	188	112	111	176	132	45	132	33
18	49	50	51	52	57	63	60	57	55	53	57	49	44	43	41
19	45	45	62	59	53	65	55	53	51	45	45	44	40	35	31
20	− 28	1	72	49	163	199	221	147	118	92	45	42	34	20	12
21	9	75	73	124	112	557	223	75	212	134	154	90	98	20	1
22	31	78	57	82	136	154	188	223	168	112	37	52	47	− 19	35
23	64	62	112	108	142	142	164	123	79	124	54	18	15	24	40
24	− 20	45	65	79	68	70	70	54	57	62	63	49	44	23	25
25	33	25	59	79	102	120	114	82	90	81	72	55	34	5	17
26	9	50	65	44	109	92	112	100	88	62	35	23	23	32	21
27	27	47	105	68	79	82	73	89	57	51	45	47	43	34	27
28	− 1	34	57	54	55	63	70	72	57	42	25	37	51	34	23
29	43	43	78	79	120	102	102	68	42	47	34	40	38	35	25
30	71	39	43	115	128	99	142	221	134	62	40	44	37	34	33
31	32	22	54	50	88	79	94	148	162	91	62	21	19	23	18
Mean	36	51	71	80	93	115	109	100	87	67	51	44	35	30	25
1919															
Apr 1	23	34	54	93	102	90	123	68	55	52	45	48	43	34	23
2	37	50	42	102	101	70	67	57	62	54	46	44	33	32	26
3	47	49	49	55	68	60	60	57	58	57	52	47	45	34	34
4	38	37	50	55	59	57	59	50	59	60	55	58	45	33	37
5	40	41	47	50	47	53	59	58	52	50	49	48	42	40	31
6	41	42	47	55	68	72	68	57	55	52	49	48	34	38	21
7	7	35	52	57	57	71	90	208	72	30	45	37	4	27	25
8	37	34	45	43	57	151	123	61	12	94	69	59	33	14	0
9	34	59	63	79	81	136	109	103	91	67	68	54	42	22	1
10	35	54	60	79	113	212	216	172	148	75	58	32	23	23	1
11	69	54	79	80	92	156	118	68	65	69	59	31	34	34	25
12	42	82	90	83	87	134	148	119	122	83	46	33	34	25	1
13	14	48	55	87	89	88	79	100	90	70	53	45	38	34	34
14	34	41	61	74	101	70	69	68	59	57	54	45	40	34	31
15	44	35	35	55	52	57	55	57	57	55	51	47	37	34	29
16	38	42	48	51	68	157	91	79	79	60	53	48	39	23	3
17	63	57	55	104	146	101	134	133	151	84	104	58	57	34	41
18	31	77	57	132	212	123	114	112	107	101	132	192	17	30	39
19	− 7	98	77	79	170	163	119	57	88	141	52	31	37	36	20
20	28	68	77	117	78	97	196	190	110	74	59	30	34	33	9
21	99	71	64	223	246	198	166	107	94	61	46	45	15	27	5
22	33	44	57	94	113	166	169	190	120	89	111	30	33	23	12
23	[32	52	48	59	75	112	184	55	59	57]					
24											[58	54	43	33	23
25	33	58	92	113	101	90	70	62	59	54	41	49	32	32	25
26	32	39	57	60	67	74	63	60	57	57	54	48	44	38	32
27	34	44	55	60	70	68	68	65	68	64	45	37	40	34	27
28	52	57	53	79	126	90	129	82	52	49	45	44	34	40	38
29	23	34	27	79	74	79	64	60	58	61	45	48	43	23	23
30	11	32	101	73	78	93	90	85	65	45	42	43	35	28	12
Mean	36	51	59	83	97	106	104	93	77	67	58	50	35	31	22

( ) = Interpolated [ ] = Not used in the mean

October 3, 1918, to August 9, 1919—Continued

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Maximum			Minimum			Range
1919	′	′	′	′	′	′	′	′	′		′	*h*	*m*	′	*h*	*m*	′	′
Mar 1	32	54	43	42	−114	−32	−2	−1	23	2	47	7	34	490	19	20	−241	731
2	35	30	32	17	164	−67	23	−52	29	2	41	19	13	499	20	28	−192	691
3	38	7	23	34	84	112	−99	−124	207	2	61	20	54	426	22	55	−366	792
4	10	21	37	32	133	71	12	−12	23	2	50	6	58	134	22	03	−237	371
5	30	38	33	33	23	53	44	−2	33	1	49	1	24	347	22	15	−55	402
6	38	38	39	46	44	23	23	28	42	2	62	7	30	443	10	46	−62	505
7	37	35	34	46	44	42	37	58	38	1	67	5	48	420	11	57	−8	428
8	7	13	−21	27	41	41	27	73	49	1	52	2	35	265	17	30	−94	359
9	32	42	40	43	42	42	43	36	39	1	51	3	04	157	23	42	10	147
10	35	34	40	39	40	39	38	40	41	0	46	0	09	99	16	40	31	68
11	13	14	23	34	33	37	41	34	38	0	39	8	28	68	15	52	4	64
12	20	21	38	42	29	13	31	7	43	1	38	9	42	131	22	36	−21	152
13	30	29	32	33	35	31	29	22	64	1	50	23	08	216	22	58	14	202
14	12	23	19	−15	−15	−39	1	−10	9	2	40	21	17	238	21	22	−141	379
15	10	34	10	38	42	40	37	23	15	2	47	3	05	337	17	37	−73	410
16	8	1	12	23	−66	−44	−27	1	23	1	32	4	58	158	19	26	−89	247
17	23	0	−1	8	21	39	47	43	44	1	71	7	40	238	17	32	−34	272
18	37	40	43	44	44	40	43	45	34	0	48	22	57	127	23	39	10	117
19	33	27	23	31	30	32	18	−8	5	0	38	23	22	98	23	00	−105	203
20	23	32	33	2	−10	−32	−84	1	−20	2	47	6	06	424	21	14	−231	655
21	59	65	14	40	79	35	11	13	−44	2	93	5	40	846	23	49	−274	1120
22	37	1	34	98	−3	−116	−9	0	44	2	61	19	31	598	19	42	−285	883
23	33	37	11	−15	0	−30	−1	−22	25	2	55	3	20	352	21	54	−121	173
24	33	30	34	42	43	40	37	34	34	1	45	4	00	111	13	56	−1	112
25	22	24	3	−24	4	13	20	11	72	1	46	23	05	331	23	49	−80	411
26	32	9	30	25	28	18	27	4	20	1	44	4	57	157	22	08	−22	179
27	23	23	21	21	1	−10	−10	22	23	1	41	2	12	187	21	10	−44	231
28	44	43	5	21	44	14	−32	13	74	2	37	20	07	287	22	18	−124	411
29	12	35	29	13	35	12	9	29	18	2	46	3	11	237	20	51	−80	317
30	23	5	22	18	1	24	18	−18	−11	2	55	7	33	323	0	01	−148	471
31	28	28	−19	14	27	−60	−48	14	31	2	41	20	18	372	20	42	−222	594
Mean	27	27	23	27	29	12	10	10	34		49 7			294			−106	400

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Maximum			Minimum			Range
1919																		
Apr 1	20	21	9	45	32	33	33	22	28	1	47	6	30	199	17	40	−5	204
2	27	27	29	23	29	34	34	23	10	1	44	4	05	163	21	11	−17	180
3	28	31	27	32	34	23	25	−9	23	0	41	21	45	92	22	38	−68	160
4	15	34	10	28	10	34	23	−5	42	1	41	20	22	154	21	58	−88	242
5	34	34	34	34	35	38	35	39	40	0	43	6	50	72	14	53	24	48
6	−6	−12	11	20	−5	9	12	−10	19	1	33	23	36	169	16	15	−51	220
7	23	13	34	38	32	23	29	34	39	2	45	7	25	292	0	03	−77	369
8	12	12	21	−18	−5	23	23	20	23	2	39	18	04	333	18	22	−85	418
9	−3	−6	3	14	12	1	−37	25	37	1	44	5	34	149	21	20	−161	310
10	1	12	−1	9	23	33	7	21	23	1	60	5	57	320	21	34	−1	321
11	14	12	20	15	35	35	−8	−13	3	1	48	0	43	257	21	48	−80	337
12	−7	14	24	9	−6	−18	−64	−35	−12	1	43	1	48	212	21	15	−89	301
13	29	23	25	28	31	29	32	35	38	1	50	8	05	123	16	42	12	111
14	30	27	27	25	33	34	35	38	40	0	47	4	38	132	18	18	18	114
15	27	25	20	24	24	27	25	13	22	0	38	3	57	65	22	56	−7	72
16	13	0	13	21	23	−11	−26	−80	−10	1	34	5	29	192	22	37	−172	364
17	24	11	9	−52	−191	−44	−32	49	42	2	47	22	27	241	19	52	−383	624
18	25	13	7	39	14	38	4	−8	−20	2	68	4	35	330	22	30	−132	462
19	25	13	−8	110	12	40	31	34	32	2	61	4	37	328	17	36	−42	370
20	28	22	23	11	13	42	35	23	−10	1	58	7	01	337	23	48	−54	391
21	−2	−18	1	−21	−21	1	19	9	−21	2	59	4	00	646	19	38	−126	772
22	14	15	−2	23	34	20	1	12	27	1	60	5	56	276	17	40	−59	335
23																		
24	21	12	23	12	30	9	−2	−65	33]									
25	20	12	21	14	10	13	12	4	25	1	43	5	31	163	22	51	−29	192
26	28	27	27	27	23	34	19	12	22	0	42	5	20	90	22	58	−9	99
27	27	16	11	21	22	28	30	22	20	0	41	5	05	77	22	42	−1	78
28	23	20	23	23	33	31	23	21	31	1	50	6	08	176	22	03	7	169
29	22	22	10	0	21	22	9	17	−16	1	35	3	04	90	23	13	−50	140
30	14	−3	12	23	14	4	18	23	34	1	40	3	00	168	20	49	−35	203
Mean	19	15	16	20	13	21	12	12	19		46 5			209			−63	272

( )=Interpolated [ ]=Not used in the mean

TABLE 17—*Hourly Values of Declination at Cape Chelyuskin,*

[26° East Plus Tabular Quantities]

Day	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h	13^h–14^h	14^h–15^h
1919	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
May 1	38	45	55	68	100	114	73	79	45	48	45	45	39	31	27
2	31	38	57	58	64	65	100	88	57	111	99	− 10	− 1	28	28
3	28	42	32	93	187	158	104	164	214	201	190	181	198	120	87
4	− 8	29	47	82	132	192	228	157	79	65	31	43	34	33	23
5	58	34	42	168	200	246	153	162	146	242	59	79	52	23	− 13
6	37	52	57	77	134	167	186	143	109	81	65	34	33	27	22
7	22	47	54	78	101	161	148	98	48	67	64	45	34	37	9
8	32	38	61	64	132	132	92	80	53	60	50	44	34	28	20
9	14	34	45	59	88	139	156	102	65	59	61	23	21	18	8
10	12	34	47	57	69	77	162	100	64	53	45	54	41	32	7
11	58	44	51	53	59	64	60	61	62	55	53	45	41	37	33
12	43	50	60	68	72	71	67	64	64	57	54	45	42	34	40
13	10	44	70	92	98	141	158	134	92	103	98	120	156	73	8
14	12	10	90	177	104	133	137	109	77	79	71	78	44	34	27
15	− 8	− 18	22	77	231	134	142	207	168	79	57	74	50	45	31
16	32	42	51	74	134	122	97	62	65	88	103	64	29	23	− 8
17	32	44	55	68	143	151	129	131	77	41	43	42	35	31	14
18	− 27	− 8	49	174	143	110	182	190	130	129	110	115	70	38	12
19	12	40	58	57	120	85	71	68	62	59	55	45	38	21	20
20										[138	123	57	17	21	21
21	[17	28	49	88	82	77	98	97	121]						
22											[68	31	9	19	23
23	41	40	52	79	209	230	184	199	70	49	44	44	44	40	38
24	1	33	67	82	64	71	142	118	87	51	73	93	61	47	82
25	− 2	18	20	157	143	168	130	248	112	117	84	72	71	42	31
26	9	43	71	82	83	79	83	82	101	75	60	43	38	34	13
27	− 1	22	29	45	112	101	183	137	54	68	62	44	55	23	23
28	1	18	59	93	94	75	68	61	70	55	47	44	42	37	33
29	30	50	21	92	82	82	105	81	68	68	67	53	33	32	30
30	33	58	70	79	79	65	71	73	69	67	59	45	37	29	20
31	38	31	57	84	103	115	112	117	74	45	68	67	38	21	22
Mean	21	34	52	87	117	123	126	118	85	81	68	60	50	36	25
1919															
Jun 1	33	51	57	69	80	77	80	67	64	64	53	45	43	37	30
2	39	54	69	82	112	122	118	90	72	64	54	45	40	32	28
3	12	34	88	147	179	181	179	140	93	68	43	43	33	25	19
4	23	44	47	79	79	87	90	89	78	70	58	49	42	29	4
5	37	37	53	60	67	68	69	72	65	72	57	52	45	43	23
6	34	40	45	120	123	103	100	77	68	68	49	42	34	23	20
7	12	44	60	83	53	149	124	88	[79	68]	57	53	27	22	21
8	33	42	43	69	78	90	71	79	77	64	49	45	35	25	19
9	38	57	69	68	84	101	92	75	71	67	77	54	33	79	5
10	23	61	57	87	146	268	309	257	190	148	79	15	33	11	1
11	1	35	50	112	167	123	112	90	129	77	57	34	34	23	13
12															
13	33	38	54	122	112	174	212	154	[126	95	67]	36	27	14	− 1
14	[12	21	68	77	131	126	92	79]							
15										[88	60	39	35	20	14
16	37	42	60	78	81	115	157	101	75	71	67	57	42	24	17
17	15	38	58	84	134	156	134	127	123	71	54	43	34	11	− 7
18	12	23	39	77	79	83	79	77	94	101	82	23	37	37	30
19	37	54	67	67	83	144	160	122	77	59	48	45	43	45	33
20	44	50	58	47	58	65	59	57	57	63	61	57	48	14	34
21	[34	45	57	68	88	77	83	83	77]						
22											[59	51	32	31	32
23	0	65	73	103	100	170	223	178	143	99	38	23	17	14	15
24	− 21	− 21	12	120	134	236	182	257	246	132	107	83	69	32	31
25	[1	27	57	67	82	98	93	105	90	65]					
26										[54	50	33	14	12	12
27	20	38	69	89	82	91	75	74	68	67	65	50	44	34	23
28	31	44	64	92	93	122	122	101	72	59	49	44	38	35	34
29	[35	27	64	95]							[60	53	33	12	1
30	10	25	49	79	90	81	81	68	68	67	55	43	35	33	24
Mean	23	41	56	88	101	128	129	111	97	78	60	45	38	31	19

[ ] = Not used in the mean

October 3, 1918, to August 9, 1919—Continued

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Magnetic character	Mean	Maximum			Minimum			Range
	′	′	′	′	′	′	′	′	′		′	h	m	′	h	m	′	′
1919																		
May 1	23	23	15	14	30	25	11	7	19	1	42	4	58	148	22	50	−5	153
2	12	1	3	−8	7	−77	65	−69	−57	2	29	21	27	468	21	07	−176	644
3	78	60	25	−28	−37	14	8	−77	−7	2	85	4	50	415	22	45	−139	554
4	21	31	22	15	34	15	30	−2	−24	1	55	6	00	308	23	15	−72	380
5	38	21	−21	−19	−97	−10	3	10	29	2	67	4	12	412	19	18	−166	578
6	−1	−11	1	23	9	−15	−19	0	1	1	50	5	32	232	20	32	−117	349
7	1	13	27	23	27	23	30	28	32	1	51	5	51	192	16	20	−13	205
8	10	12	23	33	34	38	31	29	9	1	47	5	15	174	23	51	−10	184
9	2	14	10	13	33	31	23	12	20	0	44	6	10	169	18	26	−2	171
10	9	4	−12	−13	−51	−39	1	−10	23	1	32	6	34	′ 198	20	06	−170	368
11	32	31	34	34	43	38	37	35	42	1	46	0	04	139	16	25	27	112
12	22	17	12	11	0	3	−13	−9	−2	0	36	5	55	79	23	28	−46	125
13	−10	−29	−9	12	−10	−42	−39	−27	14	2	52	12	00	197	20	52	−182	379
14	15	−27	−36	14	−28	−96	−9	25	15	2	44	3	30	281	20	18	−224	505
15	18	−8	9	22	23	11	−57	1	1	2	55	4	51	559	1	15	−152	711
16	14	18	12	12	18	8	57	−6	20	1	47	4	20	168	22	18	−134	302
17	19	28	10	14	5	8	−102	−35	−35	1	40	5	02	210	21	39	−206	416
18	4	7	12	0	5	5	34	45	30	2	65	3	04	540	20	36	−36	576
19	20	22	20	21	32	13	−10	−10	7	1	39	4	32	134	22	00	−32	166
20	23	30	30	22	34	40	33	9	17]									
21																		
22	21	31	34	22	20	29	22	37	38]									
23	35	34	33	25	3	−27	−19	−21	1	2	59	6	12	234	20	10	−77	311
24	57	33	−10	−16	−132	−159	−121	−79	17	2	28	6	55	179	20	26	−237	416
25	1	14	8	−20	12	1	−17	10	−32	2	57	7	27	363	23	45	−172	535
26	12	20	15	−56	−106	−99	−144	−108	−62	1	15	8	09	130	21	31	−177	307
27	22	12	−25	−10	−44	−6	−10	−5	5	1	37	6	47	231	20	18	−75	306
28	22	3	−9	38	13	−5	20	−12	−20	1	35	4	27	104	23	01	−90	194
29	28	25	30	34	30	32	34	27	28	1	48	6	12	137	23	06	10	127
30	17	20	11	23	23	22	0	23	14	0	42	4	07	93	21	30	−13	106
31	14	12	13	23	22	34	12	13	22	0	48	5	26	142	21	30	−16	158
Mean	19	14	8	8	−4	−9	−6	−7	4		46 3			237			−97	334
1919																		
Jun 1	22	22	5	8	13	14	27	18	27	0	42	4	32	101	18	14	0	101
2	22	14	13	14	11	19	17	14	39	0	49	5	55	166	17	58	−22	188
3	21	15	14	21	22	27	31	25	25	1	62	6	57	200	17	09	11	189
4	31	23	23	23	24	28	28	21	22	0	45	7	12	107	14	36	−19	126
5	23	23	23	30	34	34	24	18	1	0	43	7	38	85	23	27	−13	98
6	11	21	19	14	12	17	−10	15	5	0	44	3	26	147	21	40	−24	171
7	23	12	21	23	34	52	15	21	22	0	48	6	00	171	21	36	9	162
8	24	27	32	32	27	27	33	32	33	0	45	5	34	110	14	42	9	101
9	0	13	21	−15	−5	−11	−60	−46	−10	1	36	5	04	127	21	55	−111	238
10	−22	−9	14	−7	−35	−58	−21	−11	4	1	64	6	48	495	20	33	−114	609
11	1	−20	−1	−9	35	−19	−13	−13	−11	1	42	4	08	265	20	56	−121	386
12		[9	−3	−1	−9	−9	−17	−5	8]									
13	0	−28	1	0	−45	−55	−28	8	1	1	47	6	26	279	20	42	−289	568
14																		
15	11	−5	31	14	13	11	3	11	21]									
16	22	23	17	15	28	32	32	23	9	0	51	6	32	183	23	40	3	180
17	−6	10	21	13	21	1	0	1	2	0	47	5	27	190	21	22	−30	220
18	30	24	29	34	34	43	35	29	40	0	49	10	45	123	11	48	18	105
19	23	23	27	24	31	31	34	34	32	0	56	5	47	178	15	17	14	164
20	23	26	28	24	21	23	22	28	31	0	43	5	48	69	21	08	14	55
21																		
22	32	31	27	21	25	22	32	33	−15]									
23	4	14	18	−34	−10	23	19	−25	−24	2	52	5	58	387	19	05	−59	446
24	−12	−9	−13	−10	12	−5	−12	−30	−16	2	63	5	20	368	21	40	−52	420
25																		
26	22	23	8	−7	11	9	−3	21	38]									
27	23	20	22	31	31	32	18	12	0	0	45	4	04	97	23	45	−13	110
28	31	22	23	21	21	28	29	34	34	0	52	6	30	153	16	40	3	150
29	−1	9	−5	2	−22	−42	−45	−66	−52]									
30	22	20	23	22	28	25	22	27	33	0	43	4	00	108	21	12	17	91
Mean	14	13	17	12	16	14	11	11	14		48 6			187			−35	222

[ ] = Not used in the mean

TABLE 17—*Hourly Values of Declination at Cape Chelyuskin,*

[26° East Plus Tabular Quantities]

Day	0h–1h	1h–2h	2h–3h	3h–4h	4h–5h	5h–6h	6h–7h	7h–8h	8h–9h	9h–10h	10h–11h	11h–12h	12h–13h	13h–14h	14h–15h
1919	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Jul 1	[32	39	49	77	70	64	65	68	69]						
8															
9	26	50	67	75	96	181	166	161	87	60	64	52	42	30	13
10	16	28	66	83	113	194	226	103	61	78	63	41	36	27	17
11	−17	28	50	72	92	87	84	64	66	66	41	28	28	27	22
12	33	44	46	90	133	150	130	115	93	61	61	44	27	22	14
13	4	38	71	93	112	140	97	97	83	68	40	37	27	26	27
14	−4	15	24	46	139	162	111	90	72	66	58	47	41	25	25
15	37	40	45	70	85	125	116	72	72	(66)	37	39	37	33	25
16	39	47	45	51	69	58	58	70	68	63	58	44	38	34	29
17	21	28	52	80	81	126	113	97	78	59	45	47	57	25	−8
18	−57	−27	37	63	137	237	218	130	108	112	101	49	44	−8	2
19	37	44	70	74	126	141	159	114	114	81	59	44	40	34	25
20											[50	48	39	33	25
21	2	25	84	67	94	102	92	82	72	(63)	54	42	29	10	28
22	30	35	42	56	66	101	197	177	86	57	53	46	33	28	10
23	−37	−14	67	63	97	86	115	108	175	114	75	99	46	19	12
24	32	39	54	91	97	123	162	121	68	76	62	49	45	44	29
25	8	45	63	74	84	91	133	125	86	62	42	38	40	34	34
26	27	30	42	114	112	97	75	76	77	42	28	23	16	17	16
27	8	2	10	45	78	84	64	58	50	46	52	47	29	17	−2
28	9	30	27	62	86	86	55	53	53	53	42	30	20	16	8
29	19	30	46	54	52	53	63	62	58	39	13	31	19	20	12
30	2	20	42	66	100	99	101	97	54	44	31	29	22	24	19
31	35	36	44	51	63	67	75	69	(61)	54	37	36	31	21	20
Mean	12	28	50	70	96	118	119	97	79	65	51	43	34	24	17
1919															
Aug 1	19	17	42	65	91	60	60	46	46	59	54	12	14	15	2
2	[−7	15	19	57	82]										
3											[15	35	26	26	4
4	32	46	71	113	159	106	66	54	49	49	45	37	32	25	20
5	35	43	64	82	89	139	92	63	51	55	46	37	26	21	20
6	30	49	49	26	115	220	227	140	62	52	43	46	41	36	25
7	13	34	80	96	126	85	60	60	57	54	47	46	36	26	19
8	4	29	62	83	138	138	130	193	82	51	49	37	26	24	21
9	[26	34	40	68	88	122	114	90	85]						
Mean	22	36	61	78	120	125	106	93	58	53	47	36	29	24	18

( ) = Interpolated [ ] = Not used in the mean

TABLE 18—*Mean Monthly Values of East Declination at Cape Chelyuskin*

Month	Mean declination (26° +)				Number of days			
	All days	Days with character-number			All days	Days with character-number		
		0	1	2		0	1	2
1918	′	′	′	′				
October	57	55	58	56	16	1	9	6
November	50	46	47	58	21	5	9	7
December	53	45	48	63	23	4	10	9
1919								
January	47	42	46	55	25	6	13	6
February	54	47	49	59	28	6	7	15
March	50	43	49	52	31	4	12	15
April	46	42	46	53	28	6	16	6
May	46	42	42	54	28	4	14	10
June	49	47	50	58	22	15	5	2
July	39	32	44	35	22	8	13	1
August	36		36		6	0	6	0
Means and sums								
October to March	52	45	49	57	144	26	60	58
April to August	45	42	43	53	106	33	54	19
All days	49	43	46	56	250	59	114	77

October 3, 1918, to August 9, 1919—Concluded

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Maximum		Minimum		Range
1919	′	′	′	′	′	′	′	′	′		′	h m	′	h m	′	′
Jul 1																
8			[− 9	13	− 2	3	− 9	− 28	− 28]							
9	6	− 20	− 6	− 8	− 5	− 3	5	− 20	0	1	47	5 32	299	17 05	− 73	372
10	20	16	20	16	4	4	14	38	− 3	1	53	6 09	299	23 52	− 18	317
11	14	− 6	23	15	25	16	− 4	− 12	− 17	1	33	5 28	112	23 08	−107	219
12	13	10	2	5	2	− 28	4	13	2	1	45	5 30	204	20 10	− 44	248
13	25	16	10	4	4	− 7	− 2	− 28	− 16	1	40	5 32	172	22 18	− 47	219
14	13	3	7	− 37	− 15	13	18	26	27	1	40	5 10	214	18 33	− 65	279
15	23	25	25	23	23	21	25	31	33	0	47	6 18	170	20 43	14	156
16	18	7	25	4	0	− 27	− 19	12	23	0	34	4 20	80	21 03	−101	181
17	7	14	12	8	− 16	− 12	− 45	− 45	− 42	1	33	5 52	140	23 54	− 97	237
18	4	− 19	3	− 26	2	− 38	− 10	− 10	10	1	44	5 50	315	0 30	−115	430
19	24	24	24	25	31	25	15	25	(31)	1	58	6 34	181	21 45	12	169
20	30	27	24	23	23	20	14	− 3	7]							
21	29	33	20	23	19	20	24	26	30	1	45	4 30	126	20 02	15	111
22	− 14	− 37	− 36	− 27	− 1	− 26	− 17	− 27	− 32	1	33	6 53	251	16 24	− 58	309
23	12	− 3	− 25	− 34	− 31	− 28	− 50	− 44	19	2	35	8 02	277	21 40	− 95	372
24	− 3	25	8	− 31	16	− 3	8	13	6	1	47	6 30	224	18 21	− 50	274
25	42	34	18	19	25	19	18	7	5	1	48	6 42	186	22 20	− 34	220
26	17	8	− 11	− 14	2	18	7	9	2	0	35	3 42	142	18 10	− 36	178
27	− 26	0	− 11	− 3	3	− 1	− 12	0	3	0	23	5 03	105	17 07	− 28	133
28	6	6	− 4	6	19	3	2	10	24	0	29	5 00	108	17 18	− 14	122
29	5	− 18	− 14	− 16	− 64	− 24	− 22	− 16	12	0	17	7 00	67	19 16	−135	202
30	17	20	10	− 2	− 2	− 4	− 13	1	− 2	0	32	7 05	154	21 02	− 39	193
31	9	8	− 2	− 2	29	29	22	24	30	0	35	6 22	84	18 00	− 25	109
Mean	12	7	5	− 2	3	− 2	− 1	2	7		38 9		178		− 52	230
1919																
Aug 1	− 24	− 20	− 26	− 40	− 9	− 9	− 13	− 17	− 5	1	18	4 30	115	23 11	− 74	189
2																
3	− 7	13	1	2	− 9	− 15	− 27	− 25	4]							
4	10	13	7	11	24	5	4	− 40	− 13	1	39	5 51	190	22 48	− 68	258
5	15	− 7	− 30	− 40	− 31	− 44	− 77	− 11	15	1	27	5 19	182	21 16	−142	324
6	25	29	31	24	23	19	11	11	4	1	56	6 27	323	23 33	− 7	330
7	− 5	− 7	− 1	− 18	− 29	10	19	10	− 3	1	34	4 00	161	19 15	− 79	240
8	14	1	− 7	− 7	− 26	− 18	− 40	− 33	19	1	40	7 09	268	23 49	−129	397
9																
Mean	6	2	− 1	− 12	− 8	− 6	− 16	− 13	3		35 8		206		− 83	290

( ) = Interpolated [ ] = Not used in the mean

on the days which are most disturbed and the smallest on quiet days This feature is repeated in every single month in which days of all character-numbers are represented except in October and July, but in October there is only one quiet day and in July only one which is very disturbed For the whole period November to June we find in every month the same relation between the mean value of the declination and the magnetic character of the day, namely, a decrease of the easterly declination accompanies a decrease in the violence and magnitude of the magnetic disturbance It may also be noted that within each group there is still less evidence of an annual variation than in the means of all days

According to the right-hand part of Table 18, containing the number of days within each group for every month, the months of February and March appear to be the most disturbed and June and July the least disturbed months

(6) DIURNAL VARIATION OF DECLINATION

When dealing with the diurnal variation of the magnetic declination, it is customary to publish the mean hourly values derived from all days of the month and referred to both L M T and G M T and also for every month to give mean hourly values referred to G M. T from five selected quiet days and five selected disturbed days, preferably from those which are known as the international days and listed in the publications issued by the De Bilt Observatory The observations at Cape Chelyuskin are, however, too incomplete to be treated in this way, but it is possible to bring out the characteristic features of

the diurnal variation and the influence of the disturbances by first discussing the mean hourly values derived from all days and then grouping the days according to the magnetic character-number 0, 1, or 2 All values will be referred to L M T only, but as the time difference from Greenwich is very close to 7 hours ($7^h\ 02^m\ 40^s$), the L M T can be changed to G M T with sufficient accuracy by subtracting 7 hours

When discussing the diurnal variation of the declination at Cape Chelyuskin, the general lines will be followed which C Chree has selected for analyzing the magnetic observations of the Australasian Antarctic Expedition of 1911–14 [3]

TABLE 19—*Diurnal Inequality of Declination at Cape Chelyuskin (hourly departures from mean values for all days)*

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Month	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h
1918	′	′	′	′	′	′	′	′	′	′	′	′	′
October	4	7	27	32	46	56	59	45	9	−5	−4	−8	−11
November	12	21	21	33	39	53	47	16	−1	−11	−13	−14	−15
December	−11	11	22	26	57	65	42	21	4	−5	−16	−18	−20
1919													
January	+1	−5	14	28	33	36	35	23	8	−6	−13	−19	−18
February	−20	−3	15	28	38	47	48	37	31	7	−10	−18	−19
March	−14	1	21	30	43	65	59	50	37	17	1	−6	−15
April	−10	5	13	37	51	60	58	47	31	21	12	4	−11
May	−25	−12	6	41	71	77	80	72	39	35	22	14	4
June	−26	−8	7	39	52	79	80	62	48	29	11	−4	−11
July	−27	−11	11	31	57	79	80	58	40	26	12	4	−5
August [a]	−21	−6	16	36	56	73	76	55	34	17	10	2	−6
September [a]	−12	0	20	35	52	67	66	45	25	6	3	−3	−8
October-March	−5	5	20	30	43	54	48	32	15	0	−9	−14	−16
April-September	−20	−5	12	36	56	72	73	56	36	22	12	3	−6
Year	−12	0	16	33	50	63	61	44	25	11	1	−6	−11

Month	13^h–14^h	14^h–15^h	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Range	Average departure
1918	′	′	′	′	′	′	′	′	′	′	′	′	′
October	−16	−15	−19	−21	−24	−27	−20	−43	−36	−19	−7	102	23 3
November	−15	−12	−6	−2	−8	−12	−20	−25	−33	−28	−7	86	19 8
December	−17	−17	−13	−7	−9	−20	−12	−19	−10	−22	−25	90	20 4
1919													
January	−17	−17	−13	−11	−13	−8	−4	−9	−7	−14	−1	55	14 7
February	−22	−24	−21	−18	−16	−1	−9	−10	−20	−26	−24	74	21 8
March	−20	−25	−23	−23	−27	−23	−21	−38	−40	−40	−16	105	27 2
April	−15	−24	−27	−31	−30	−26	−33	−25	−34	−34	−27	94	27 8
May	−10	−21	−27	−32	−38	−38	−50	−55	−52	−53	−42	135	38 2
June	−18	−30	−35	−36	−32	−37	−33	−35	−38	−38	−35	118	34 3
July	−15	−22	−27	−32	−34	−41	−36	−41	−40	−37	−32	121	33 2
August [a]	−14	−22	−26	−30	−32	−38	−37	−44	−42	−38	−28	120	31 6
September [a]	−15	−18	−21	−25	−26	−32	−30	−40	−38	−33	−21	107	26 7
October-March	−18	−18	−16	−14	−16	−15	−14	−24	−24	−25	−13	79	20 3
April-September	−14	−23	−27	−31	−32	−35	−36	−40	−41	−39	−31	114	31 6
Year	−16	−21	−22	−22	−24	−25	−25	−32	−32	−32	−22	95	25 1

[a] Interpolated

(7) DIURNAL VARIATION DERIVED FROM ALL DAYS

Table 19 contains the mean hourly departures from the mean of the month derived from all days of the ten months October 1918 to July 1919 The values have not been corrected for non-cyclic changes, and these are not entered in any tables, because the observations are too incomplete to allow computation of the non-cyclic changes for every

[3] C CHREE, Analysis and Discussion of Magnetograph Curves Australasian Antarctic Expedition, 1911–14 Scientific Reports, Series B, Vol I, Part II

month Almost every month contains days on which the curve has faded out around midnight While it is possible to determine or extrapolate the value for the last hour of the day, yet it is not possible to extend the extrapolation to the first hour of the following day, which must be known in order to compute the non-cyclic change This, however, is found to be very small in the few complete months, and for this reason the knowledge of the value for every month scarcely would be of any importance The few values in August have been omitted, but instead mean hourly departures have been interpolated for the two missing months August and September in order to obtain monthly values for a complete year The interpolation has been made graphically by plotting the ten observed monthly values for every hour and drawing a smooth curve representing the annual variation of the departures for every hour From these curves the values for the missing months were read The process is somewhat arbitrary, but the interpolated values are undoubtedly sufficiently accurate to fulfill their purpose The last two columns of the table contain the ranges and the average departures Quantities with a minus sign are hourly departures to westward, others are to eastward

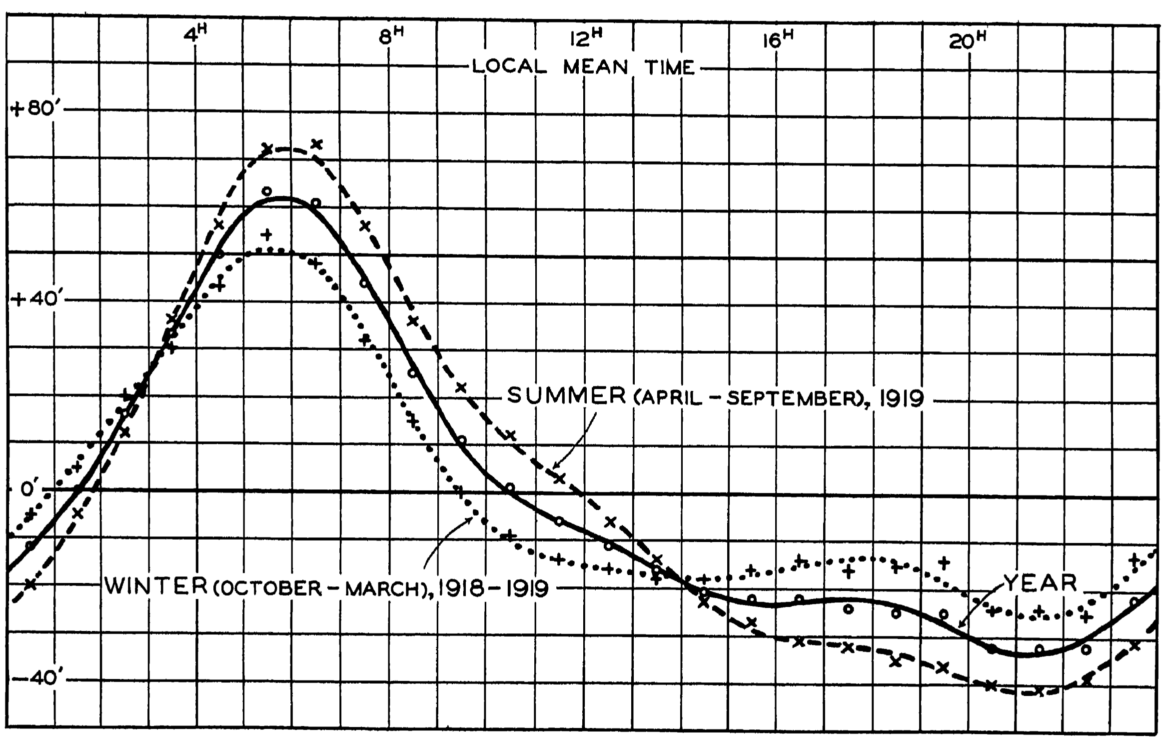


FIG 20—Diurnal variation of magnetic declination at Cape Chelyuskin, mean for April 1918 to March 1919 and means for summer, April to September 1919 and winter, October to March 1918-19

The diurnal variation shows great irregularities from month to month as could be expected, considering the very great variation of the declination which occurs at this station The irregularities to a great extent are smoothed in the means for the winter October to March, the summer April to September, and the year, which are entered at the bottom of the table These mean values are represented graphically in Figure 20, in which curves which have been computed from the results of the harmonic analysis are entered We find in both seasons a rapid increase of the declination between midnight and 6^h, when the pronounced morning maximum is reached, a rapid decrease between 6^h and 11^h, and later a more or less irregular decrease until the minimum value is reached between 21^h and 22^h. In winter, however, the morning maximum is reached

somewhat earlier than in summer, and, furthermore, we find in winter a secondary maximum and minimum at about 18^h and 14^h 5, but these secondary extremes in summer are suppressed by a stronger development of the primary extremes An inspection of the values from the single months leaves no doubt as to the reality of the features, which will find further confirmation when the diurnal variation at this station is compared with the variation at neighboring stations

From Table 19 we find that the ratio between summer and winter range is 1 44 and between summer and winter average departures is 1 56

TABLE 20—*Diurnal Inequality of Declination at Cape Chelyuskin on Days of Different Magnetic Character-Numbers (hourly departures from mean values)*

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Magnetic character	Period	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h
		′	′	′	′	′	′	′	′	′	′	′	′	′
0	Oct to Mar	2	6	9	12	15	21	20	9	7	1	− 2	− 4	− 6
	Apr to Aug	−13	− 3	9	29	39	49	46	36	26	19	10	1	− 6
	Oct to Aug	− 6	1	9	22	29	37	35	24	18	11	5	− 1	− 6
1	Oct to Mar	− 7	9	22	27	39	48	40	29	13	0	− 4	− 9	− 3
	Apr to Aug	−20	− 3	15	36	63	83	85	61	36	23	13	0	− 7
	Oct o Aug	−13	4	19	32	50	65	62	45	24	11	4	− 5	−10
2	Oct to Mar	− 9	− 1	21	39	58	74	69	47	25	3	−16	−23	−25
	Apr to Aug	−37	−20	0	57	87	93	89	96	65	53	29	24	2
	Oct to Aug	−16	− 6	16	43	65	79	74	59	35	15	− 5	−11	−18
All days	Oct to Mar	− 7	4	19	29	42	53	48	32	16	1	− 8	−14	−17
	Apr to Aug	−21	− 6	10	37	59	73	73	59	38	27	14	4	− 6
	Oct to Aug	−13	− 1	15	32	49	62	58	44	25	12	1	− 7	−12

Magnetic character	Period	13^h–14^h	14^h–15^h	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Range	Average departure
		′	′	′	′	′	′	′	′	′	′	′	′	′
0	Oct to Mar	− 7	− 8	− 9	− 9	− 9	− 6	− 7	− 7	−10	−10	− 9	31	8 5
	Apr to Aug	−13	−19	−23	−24	−26	−25	−23	−21	−27	−25	−21	76	22 2
	Oct to Aug	−10	−14	−16	−17	−18	−17	−16	−14	−19	−18	−16	56	15 8
1	Oct to Mar	−14	−17	−14	−15	−17	−19	−19	−20	−22	−21	−11	70	18 7
	Apr to Aug	−15	−26	−30	−33	−33	−36	−36	−40	−45	−45	−37	130	34 2
	Oct to Aug	−14	−21	−21	−24	−24	−27	−27	−29	−33	−32	−23	98	25 5
2	Oct to Mar	−28	−26	−23	−15	−19	−13	−12	−34	−33	−42	−24	110	28 3
	Apr to Aug	−14	−26	−34	−45	−50	−53	−75	−69	−60	−61	−49	171	49 3
	Oct to Aug	−24	−26	−25	−23	−26	−23	−28	−42	−39	−43	−30	122	31 3
All days	Oct to Mar	−19	−20	−17	−15	−17	−15	−15	−24	−25	−26	−16	79	20 8
	Apr to Aug	−15	−24	−29	−33	−34	−36	−39	−40	−42	−42	−35	115	33 2
	Oct to Aug	−17	−21	−22	−22	−24	−24	−25	−30	−32	−33	−24	95	25 2

(8) DIURNAL VARIATION ON DAYS OF DIFFERENT MAGNETIC CHARACTER

In order to examine the influence of the disturbances upon the diurnal variation, Table 20 has been prepared, here, as in Table 19, hourly departures to the westward are indicated by minus signs. All complete days have been divided into three groups, according to the magnetic character-numbers, and within each group the hourly mean values have been computed for the two intervals October to March and April to August, as well as for the whole period Corresponding mean values derived from all days are entered at the bottom of the table Comparing the last-named values with those in Table 19, we find that the direct means in Table 20 of all observations from October to March agree well with the mean of the monthly mean values in Table 19, and so on We may, therefore, regard in Table 19 the mean values from the interval October to March as representative for the winter, the values from April to August as representative for the summer, and the values from the whole period as valid for the year

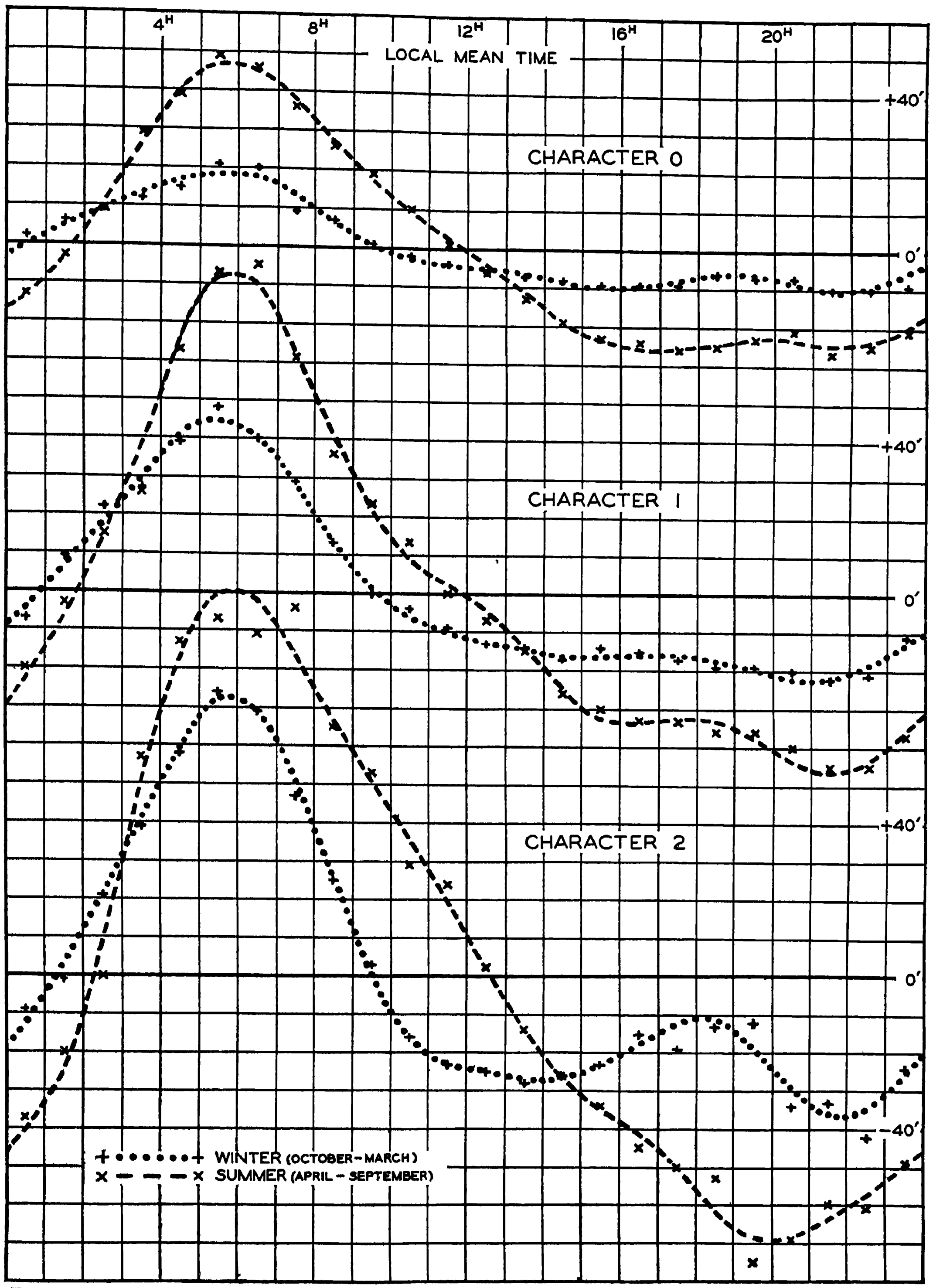


FIG 21—Diurnal variation of declination at Cape Chelyuskin, days with magnetic character-numbers 0, 1, and 2, for winter and for summer

In Figure 21 the winter and summer values for the three groups and all days have been plotted and curves based on the harmonic analysis have been drawn All curves have the same appearance, but the range of the diurnal variation in each season is much larger on disturbed than on quiet days In winter the ratio between the ranges on disturbed and quiet days is 3 74, in summer it is 2 21 The corresponding ratios for the average departures are 3 33 and 1 74, respectively. These figures show that the influence of the disturbances is almost twice as large in winter as in summer Within each group we find that the range increases from winter to summer, and this increase is most prominent for the quiet days If we form the ratios between the summer and winter ranges, we find for the groups 0, 1, and 2, respectively, 2 46, 1 71, and 1 45 Correspondingly, we find the following ratios between the average departures 2 61, 1 83, and 1 74 From all observations we find smaller values, namely, for the ratio between the ranges, 1 46, and for that between the average departures, 1 60 This is partly due to the fact that in winter we have a greater number of disturbed days than in summer, and this tends to increase the winter range derived from all days and to decrease the summer range, thus reducing the ratio.

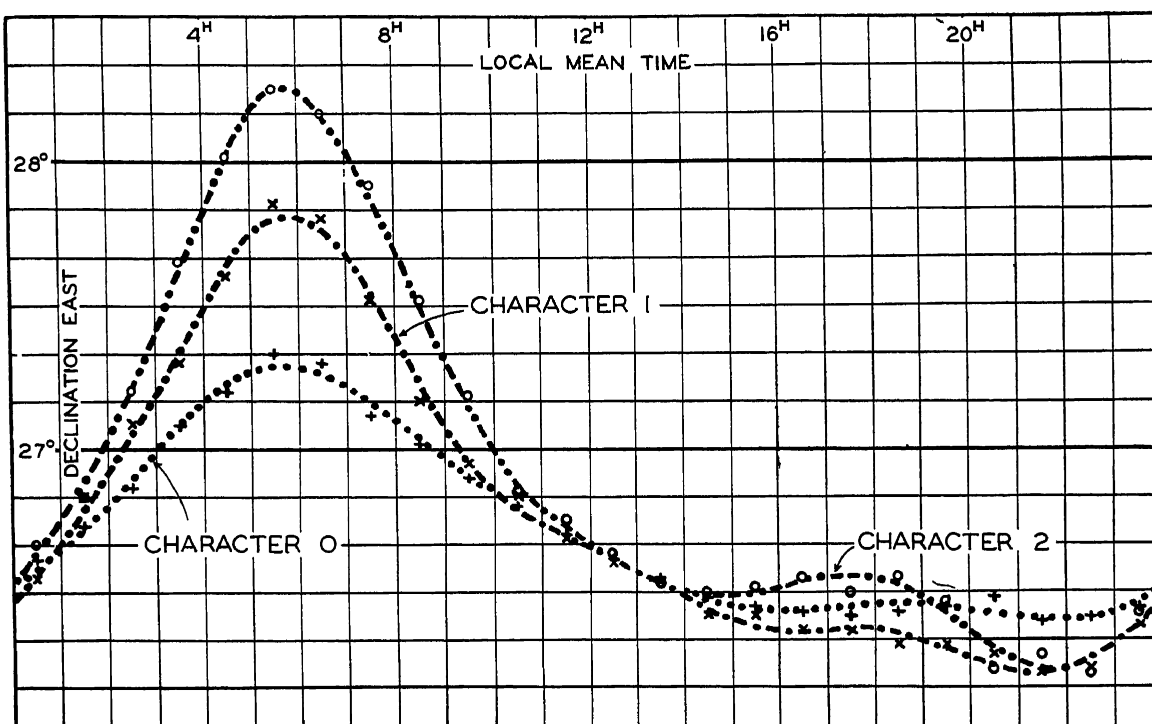


FIG 22—Diurnal variation of declination at Cape Chelyuskin, days with magnetic character-numbers 0, 1, and 2, for mean of year

From Figure 21, furthermore, it is seen that the secondary maximum and minimum, which are found in winter, are characteristic features of the disturbed days in winter The secondary extremes are indicated on all the six curves of Figure 21, but are conspicuous only on the winter curve of the very disturbed days Only within this group is present a marked difference in the appearance of the summer and winter curves Whether this feature is real or not, however, can not be decided from observations extending over less than one year

The three curves in Figure 22 represent the diurnal variation of the declination for the whole year for all days and for the days with character-number 0, 1, or 2. In this figure the actual declinations and not the deviations from mean have been entered in

order to bring out the fact that on the disturbed days the morning maximum is far more pronounced than on the quiet days, while the difference in the development of the late afternoon minimum is but small The very great values of the declination in the morning hours of disturbed days are responsible for the higher average value of the declination found on these days

(9) FOURIER CONSTANTS

The computation of the Fourier constants has been carried out to the fourth term of the formula

$$D=\overline{D}+\sum_1^n c_n \sin\,(nt+\alpha_n)$$

where the time t is reckoned from 0^h L M T , and where c_1 and α_1 represent amplitude and phase-angle of the 24-hour term, c_2 and α_2 of the 12-hour term, c_3 and α_3 of the 8-hour term, and c_4 and α_4 of the 6-hour term

The resulting amplitudes and phase-angles are entered in Tables 21 and 22 From Table 21 it is seen that the values vary more or less irregularly from month to month, but a few rules nevertheless are evident We find that the amplitude of the 24-hour wave shows an annual variation with a maximum in summer and a minimum in winter, while the phase-angle of this wave reaches a minimum in summer and a maximum in winter The amplitude of the 12-hour wave shows no annual variation, but the phase-angle reaches a minimum in summer and a maximum in winter The variations of the higher terms are too irregular to be considered trustworthy

TABLE 21—*Fourier Constants for Mean Monthly and Seasonal Values, L M T , at Cape Chelyuskin for All Days*

Month or season	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	′	°	′	°	′	°	′	°
1918								
October	36 0	4 4	15 2	307 2	5 0	166	7 2	75
November	25 9	11 4	21 0	317 8	0 6	83	6 0	76
December	27 1	12 9	21 4	296 1	6 8	220	2 4	150
1919								
January	20 6	22 1	13 4	281 1	4 3	196	1 2	80
February	27 8	2 7	20 5	267 4	3 0	248	3 4	348
March	41 0	354 1	17 5	275 0	1 0	129	4 2	52
April	41 6	352 7	13 6	276 6	3 5	253	2 2	76
May	60 0	341 3	18 5	283 2	6 1	217	5 4	106
June	51 7	349 4	20 5	263 2	6 0	204	2 4	66
July	51 1	346 5	18 2	272 5	7 9	198	3 6	104
August (interpolated)	48 8	349 0	17 4	283 8	6 4	200	4 3	93
September (interpolated)	41 8	354 1	17 0	294 3	5 3	196	4 7	86
October to March	29 3	6 4	17 0	291 2	3 0	198	3 2	71
April to September	48 7	348 2	17 1	278 7	5 6	209	3 6	88
Year	38 6	355 4	17 1	284 8	4 3	205	3 6	82

Turning to Table 22, we find that these rules apply to the constants within every group of magnetic characters 0, 1, or 2, except the rule that the amplitude of the 12-hour wave remains constant throughout the year We find that this amplitude increases from winter to summer on the quiet or moderately disturbed days, but decreases on the very disturbed days If we form the ratio of the amplitudes of the 12-hour and 24-hour waves (Table 23), we find that this ratio decreases from winter to summer within every group, and, furthermore, that in winter it increases with increasing disturbance, while in summer it remains practically constant In Table 23 the ratios for the whole year and for the means of all days have been entered also.

TABLE 22—*Fourier Constants for Complete Days, L M T, at Cape Chelyuskin*

Magnetic character	Period	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
		′	°	′	°	′	°	′	°
0	October to March	12 4	7 8	5 4	278 0	1 1	255	1 6	38
	April to August	33 8	351 4	9 9	268 7	4 1	234	0 8	114
	October to August	24 2	355 0	8 4	276 9	2 1	241	0 9	75
1	October to March	27 6	5 5	13 3	297 2	2 8	208	2 1	86
	April to August	53 2	348 2	20 5	278 7	6 5	213	5 0	75
	October to August	39 4	355 1	16 4	286 6	4 6	210	3 4	73
2	October to March	38 9	4 1	27 2	286 0	3 0	194	5 0	61
	April to August	76 5	340 3	20 2	274 9	6 9	202	5 4	152
	October to August	46 9	355 0	25 1	281 7	4 4	196	3 9	85
All days	October to March	29 6	5 1	17 1	288 5	2 6	206	2 9	69
	April to August	50 9	347 2	17 4	275 9	5 7	214	3 1	101
	October to August	38 0	354 7	17 3	283 0	4 0	208	2 9	78

Comparing the values from group to group in Table 22, we find that the amplitudes of all terms increase with increasing disturbances, but the phase-angles remain practically constant

TABLE 23—*Ratio c_2/c_1*

Season	Group			
	0	1	2	All days
Winter	0 44	0 48	0 70	0 58
Summer	0 29	0 29	0 27	0 34
Year	0 35	0 42	0 54	0 46

(10) ABSOLUTE DAILY RANGES AND DAILY MAXIMA AND MINIMA

The absolute daily ranges at the Cape Chelyuskin station reached unusually high values, ranges exceeding 10° being frequent and the greatest range on March 21, 1919, being not less than 18° 40′ Thanks to the very large scale-value, the trace was only twice incomplete on account of excessively great variation, and in both cases the trace had the form of a distinct peak, the top of which could be extrapolated with considerable certainty.

TABLE 24—*Absolute Range for Number of Days, L M T, when Range was between the Limits Stated at Cape Chelyuskin*

Month or period	0°–1°	1°–2°	2°–4°	4°–6°	6°–8°	8°–10°	10°–12°	Greater than 12°	Sum
1918									
October	0	0	4	5	1	2	4	0	16
November	0	0	6	7	3	3	2	0	21
December	3	1	3	5	6	3	2	0	23
1919									
January	0	2	10	6	1	0	2	4	25
February	2	2	8	2	6	6	1	1	28
March	0	4	6	4	9	2	2	4	31
April	1	5	8	6	6	0	1	1	28
May	0	2	9	5	5	5	2	0	28
June	1	6	10	0	3	1	1	0	22
July	0	2	12	5	3	0	0	0	22
August	0	0	1	4	1	0	0	0	6
October to March	5	9	37	29	26	16	13	9	144
April to August	2	15	40	20	18	6	4	1	106
October to August	7	24	77	49	44	22	17	10	250

The wide limits within which the absolute ranges vary are seen from Table 24, which gives the number of days when the absolute range lay between certain values. According to this table, the range was less than 1° in only 2.8 per cent of all cases and larger than 10° in 10.8 per cent of all cases. Furthermore, it is seen that the very large ranges are absent in summer.

Table 25 contains the mean, the maximum, the minimum absolute range for every month excluding the six days of August 1919, and the ratio between the mean absolute range and the mean diurnal range.

TABLE 25—*Absolute Daily Ranges, L. M. T., for All Complete Days at Cape Chelyuskin*

Year	1918			1919							Mean
Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
	′	′	′	′	′	′	′	′	′	′	′
Mean	391	342	334	332	341	400	272	334	222	230	320
Maximum	716	626	696	762	847	1120	772	711	609	430	729
Minimum	120	153	21	61	41	64	48	106	55	109	78
Ratio	3.83	3.98	3.71	6.04	4.60	3.81	2.89	2.48	1.88	1.90	3.37
Sunspot-numbers	96.9	93.2	66.6	51.1	79.5	66.5	52.4	83.5	109.9	67.8	75.1

The series is too short to warrant drawing definite conclusions regarding a possible annual variation in the occurrence of disturbances. The values in Table 25 indicate, however, that the disturbances are most violent in the equinoctial months and least violent in the summer. The next to the last line in the table contains the ratios between the mean absolute range for every month and the range of the mean hourly values. If this ratio is taken as a measure of the violence of the disturbances, the winter appears to be decidedly the most disturbed season. The last line contains the mean sunspot-numbers derived from the days of every month from which the other means in the columns have been computed. These values do not reveal any relation between the absolute ranges and the sunspot-numbers in the individual months, and the variation of the sunspot-numbers can not account for the annual variation of the disturbances which is indicated by the absolute ranges. This variation is actually in good agreement with the results from long series of observations at other stations showing maxima in the equinoctial months, corresponding to a term depending upon the declination of the Sun, and giving higher values in December-January than in June-July, corresponding to a term depending upon the distance between the Earth and the Sun.

Tables 26 and 27 show the number of cases in which the daily extremes occur in given time-intervals of two hours. Comparing the summer and winter values within each table, we find that the extremes show a much wider scattering in winter than in summer. In winter the maximum occurs between 4^h and 8^h in only 33 per cent of all cases, but in summer it occurs in 79 per cent of all cases. The minimum occurs in winter between 20^h and 24^h in 60 per cent of the cases, but in summer it occurs in 66 per cent. This difference between winter and summer again indicates the winter as the most disturbed season.

The distribution of the daily extremes over the day indicates that the night hours from 18^h to 10^h are the most disturbed, while the hours from 10^h to 18^h are the most quiet. An inspection of the individual records verifies this conclusion. No great disturbances are ever found in the day. A special study of the diurnal variation of the disturbances will not be attempted.

Aurora borealis occurred very frequently at Cape Chelyuskin, where the displays occasionally were of magnificent brilliancy We did not keep a night-watchman and, therefore, have no records regarding the occurrence of aurora during the night A number of notes dealing with displays before 22ʰ and after 7ʰ were made, but these were among the papers which were destroyed not far from Port Dickson An investigation of the relation between aurora borealis and magnetic disturbances at Cape Chelyuskin therefore can not be undertaken

TABLE 26—*Number of Days when the Minimum Declination Occurred between Stated Hours at Cape Chelyuskin*

Month	0ʰ–2ʰ	2ʰ–4ʰ	4ʰ–6ʰ	6ʰ–8ʰ	8ʰ–10ʰ	10ʰ–12ʰ	12ʰ–14ʰ	14ʰ–16ʰ	16ʰ–18ʰ	18ʰ–20ʰ	20ʰ–22ʰ	22ʰ–24ʰ
1918												
October	2	1	0	0	0	0	0	0	1	2	7	3
November	1	0	0	0	0	1	0	1	0	1	11	6
December	5	0	0	0	1	0	0	1	1	2	4	9
1919												
January	7	0	0	0	1	0	0	1	2	3	2	9
February	5	1	0	0	3	0	1	1	1	0	4	12
March	1	0	0	0		2	1	1	4	3	7	12
April	1	0	0	0	0	0	0	1	5	4	7	10
May	1	0	0	0	0	0	0	0	2	2	14	9
June	0	0	0	0	0	1	0	3	3	2	10	3
July	1	0		0	0	0	0	0	4	5	7	5
August	0	0	0	0	0	0	0	0	0	1	1	4
October–March	21	2	0	0	5	3	2	5	9	11	35	51
April–August	3	0	0	0	0	1	0	4	14	14	39	31
October–August	24	2	0	0	5	4	2	9	23	25	74	82

TABLE 27—*Number of Days when the Maximum Declination Occurred between Stated Hours at Cape Chelyuskin*

Month	0ʰ–2ʰ	2ʰ–4ʰ	4ʰ–6ʰ	6ʰ–8ʰ	8ʰ–10ʰ	10ʰ–12ʰ	12ʰ–14ʰ	14ʰ–16ʰ	16ʰ–18ʰ	18ʰ–20ʰ	20ʰ–22ʰ	22ʰ–24ʰ
1918												
October	1	1	3	5	0	0	0	0	0	2	3	1
November	3	3	3	2	0	0	0	0	0	0	6	3
December	3	2	6	0	0	0	0	0	3	0	4	5
1919												
January	8	1	4	3	0	0	0	0	0	2	2	5
February	3	4	5	5	2	0	0	0	0	3	3	3
March	2	6	5	6	2	0	0	0	0	2	4	4
April	2	4	11	5	1	0	0	0	0	1	2	2
May	1	2	14	8	1	1	0	0	0	0	1	0
June	0	1	12	8	0	1	0	0	0	0	0	0
July	0	1	11	9	1	0	0	0	0	0	0	0
August	0	0	4	2	0	0	0	0	0	0	0	0
October–March	20	17	26	21	4	0	0	0	3	9	22	21
April–August	3	8	52	32	3	2	0	0	0	1	3	2
October–August	23	25	78	53	7	2	0	0	3	10	25	23

RECORDS OF DECLINATION OFF FOUR PILLAR ISLAND, DECEMBER 1924 TO MAY 1925

(1) INSTRUMENTS AND OBSERVATORY

When the *Maud* Expedition left Seattle on June 3, 1922 (see narrative, p 519), the photographic recording declinograph by Max Toepfer and Son was again included among the scientific instruments The declinograph, as expected, could not be used during the two years in the drift-ice, because movements of the ice made a permanent orientation impossible Attempts to determine the diurnal variation of the declination by eye-observations when the ice was apparently at rest also failed, because the turning of the ice-fields was even then great enough to make the results extremely doubtful Our

opportunity for using the declinograph came, however, when the *Maud*, returning along the Siberian coast in the beginning of September 1924, was stopped by unfavorable ice-conditions and winter-quarters had to be established off Four Pillar Island, a small island of the Bear Island group

Ice, which had accumulated around the island, prevented us from getting close to the shore We had to stay 5 miles off the island in a very exposed position where the ice at any time might break up and carry the ship away The ice actually broke several times during September and October, but our position each time was changed by only a short stretch and from October 20 to July 13 we remained in the same place In October and November several 24-hour observations of the declination were taken to determine the diurnal variation, and in the latter part of November we thought that we might safely mount the declinograph We had to place it on the ice at a suitable distance from the ship, because the distance to the shore (5 miles) was too great We had, however, no materials left with which to build on the ice a non-magnetic hut of convenient size Dahl, therefore, built a light-tight case with a sack opening, through which the observer could put his arms and change the paper on the drum One side of the case could be entirely removed if the instrument had to be adjusted or the torsion determined The case was provided with four legs which were dug in and frozen fast in the ice inside of an observing tent supplied by the Department of Terrestrial Magnetism. The whole arrangement was very primitive and the records show, therefore, numerous breaks Some of these were caused by the difficulties in keeping the clock running which drives the drum, and these were not overcome until after the original spring of the clock had been replaced by a stronger one Most of the breaks, however, were caused by the formation of frost on the lenses, which became very troublesome inside the small case, where the burning lamp supplied moisture In May, when the temperature rose close to the freezing-point within the case, the formation of frost became so great that the records had to be discontinued

Dahl attended daily to the instrument, changing the paper at 17^h, making a time break at 9^h, and wiping off the lenses if necessary. He also developed the traces, on which the writer entered the hour-marks, and read the values of the ordinates for every hour The majority of the absolute observations for determining the base-line values were taken by F Malmgren, but a few were also taken by the writer, who also took the necessary astronomical observations

(2) DECLINATION SCALE-VALUES

The scale-value for the declination is given by the formula[4]

$$\epsilon_d = \frac{\cot 1'}{2R}\left(\frac{f}{f-h}\right)$$

where

$$R = D - \frac{m}{3} - \frac{l}{3} - \frac{c}{3}$$

where D is the distance from the back of the lens of the declinograph to the sensitive paper, and where m, l, and c are the thicknesses of the movable mirror, the lens, and the cylindrical lens, respectively The measured distance from the front of the lens to the sensitized paper was 566 mm, and this distance may be regarded as equal to R, neglecting the small difference between the quantities l and $\frac{1}{3}\left(m+l+c\right)$ Introducing this value of R, we find

$$\epsilon_d = 3\ 037 \frac{f}{f-h}$$

[4] H M W EDMONDS, "Formula for scale-value determination of declination variometers" Year Book No 22, Carnegie Inst Wash (1923), p. 252.

The torsion of the quartz fiber originally belonging to the instrument was determined on November 17 and 20, giving

$$\frac{f}{f-h}=1\ 622 \qquad \text{and} \qquad \epsilon_d=4\ 936$$

The eye-observations of declination through 24 hours had shown, however, that the diurnal variation of the declination was very small at this station, and for this reason it would be desirable to increase the sensitivity of the instrument as far as possible The heavy quartz fiber, therefore, was replaced by a phosphor-bronze fiber, grade "heavy,"

TABLE 28—*Declination Base-Line Values at Four Pillar Island*

Date	L M T	Base-line
1924	h	° ′
Nov 25	11 5	1 27 3
26	12 6	26 9
Dec 1	9 8	25 4
Dec 3	12 8	1 19 2
4	12 8	18 3
5	12 8	16 9
6	10 0	17 7
6	12 4	16 4
8	12 7	18 8
9	12 6	20 2
10	12 8	17 2
11	12 2	20 2
12	12 7	14 3
13	12 9	17 8
15	12 5	15 3
16	14 7	16 2
17	12 5	16 4
18	12 8	19 2
19	12 9	16 1
Dec 20	12 3	1 11 2
22	12 1	14 1
23	12 8	16 3
25	12 9	14 4
26	12 7	14 7
27	12 4	15 9
29	12 8	16 8
30	12 4	15 2
31	12 6	15 0
1925		
Jan 1	12 4	15 1
2	12 6	14 6
3	11 5	15 6
5	12 4	15 2
6	12 4	15 1
7	12 3	16 4
10	12 4	15 8
11	12 5	15 1
13	12 1	15 1
14	10 8	14 2
15	12 9	16 9
17	12 9	15 3
19	12 2	15 0
20	12 9	16 2
1925	h	° ′
Jan 21	12 8	1 18 4
22	12 6	17 1
23	12 5	17 1
24	12 0	15 8
26	14 8	15 4
27	11 0	16 5
28	10 0	13 5
29	14 9	17 1
30	11 4	15 0
31	9 8	13 5
31	12 0	16 2
Feb 2	14 7	15 7
3	11 6	16 2
4	12 6	18 2
5	12 8	19 2
6	12 8	18 8
9	12 3	19 5
10	9 5	17 1
11	12 6	16 0
12	12 8	18 1
13	14 7	15 6
18	10 9	17 9
18	11 1	16 1
19	11 9	15 5
Feb 20	9 9	1 10 7
20	11 9	11 2
21	12 8	07 2
23	16 5	06 0
24	12 2	09 3
25	12 9	10 1
27	12 6	09 0
28	10 0	07 8
28	12 2	07 7
Mar 2	12 7	1 14 3
3	12 6	16 8
4	12 7	15 3
5	12 4	16 1
Mar 10	8 9	1 12 5
11	9 6	11 2
12	12 8	08 8
13	15 2	10 5
14	9 6	09 6
14	11 6	12 1
16	14 9	12 6
1925	h	° ′
Mar 17	14 7	1 11 5
18	15 6	10 1
24	12 7	11 5
25	10 6	10 8
26	12 4	11 9
27	12 8	14 2
28	9 8	13 4
30	12 3	13 0
31	15 0	13 8
Apr 1	11 6	14 6
3	14 9	14 0
4	10 6	12 4
6	12 5	12 1
7	15 7	11 6
8	9 4	11 9
9	12 4	13 4
11	11 7	12 9
Apr 14	11 8	1 07 6
14	16 7	07 5
16	9 5	06 7
17	9 9	09 4
18	9 6	08 1
18	11 7	06 7
Apr 20	12 8	1 38 2
21	12 3	42 1
22	12 8	44 1
24	17 6	45 5
25	8 9	45 5
27	17 0	47 5
29	10 5	43 7
29	12 4	45 6
30	12 5	42 6
May 1	11 2	42 7
2	9 4	41 5
2	11 4	42 0
4	9 6	42 7
May 6	8 8	1 21 1
8	8 9	23 4
May 11	8 9	1 15 2
12	14 8	15 2
13	8 8	16 2
14	10 0	13 0
14	12 0	16 2
15	8 8	12 8
18	15 2	15 9

which proved to be very satisfactory The coefficient of torsion was small and remained absolutely constant, as is evident from the following determinations of $\frac{f}{f-h}$

November 21, 1924	1 1092
November 24, 1924	1 1092
December 19, 1924	1 1096
April 20, 1925	1 1090
Mean	1 1092

With this value of the coefficient of torsion, we find $\epsilon_d = 3'369$

(3) BASE-LINE VALUES

The base-line was changed by small amounts on several occasions, partly by accident and partly because the instrument had to be readjusted The latter was particularly the case in April and May, when temperatures above freezing-point within the tent caused melting which shifted the instrument out of level

The absolute observations of the declination are given in the Table of Results (p 361), and the computed base-line values are given in Table 28 Horizontal lines indicate a change of the base-line The values are entered to 0 1 minute, but the accuracy of a single determination is generally not better than 1′. The ordinate of the curve could not be read with a greater accuracy than about 0 2 mm corresponding to 0′6 of declination, and an error which might easily be introduced in the time-scale, on account of its smallness, might produce an error of 1′ or more in the base-line, because the ordinate of the curve did not correspond to the observed declination Considering these circumstances, the base-line determinations generally agree well Table 29 contains the adopted base-line values for the periods in which the instrument remained unaltered These adopted values are also entered to one-tenth of a minute and probably have no greater error than ±0′.5

TABLE 29—*Adopted Base-Line Values at Four Pillar Island*

Period				Adopted base-line
From		To		
Date	L M T	Date	L M T	
	h		h	° ′
Dec 1, 1924	0	Dec 3, 1924	9	1 25 5
Dec 3, 1924	9	Dec 19, 1924	17	17 5
Dec 19, 1924	17	Dec 31, 1924	24	14 9
Jan 1, 1925	0	Jan 31, 1925	24	15 6
Feb 1, 1925	0	Feb 19, 1925	17	17 2
Feb 20, 1925	10	Mar 2, 1925	9	08 8
Mar 2, 1925	9	Mar 7, 1925	24	15 6
Mar 8, 1925	10	Apr 13, 1925	17	12 2
Apr 14, 1925	10	Apr 18, 1925	17	07 7
Apr 20, 1925	10	May 4, 1925	14	43 4
May 5, 1925	10	May 9, 1925	7	22 2
May 9, 1925	17	May 18, 1925	17	14 9

(4) HOURLY VALUES OF DECLINATION

In the field, hour-marks were entered on the traces and the ordinates for every full hour L. M T were read In the final scaling the mean hourly ordinate centered on the half-hour was read, using a glass scale and adjusting to equal areas The curves were generally smooth, so this adjustment could be made with an accuracy of 0 1 mm and the mean ordinate could be read with an accuracy of about 0.2 mm The accuracy of the

TABLE 30—*Hourly Values of Declination at Four Pillar*

[0° West Plus Tabular Quantities]

Day	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h	13^h–14^h	14^h–15^h
1924	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Dec 1	12 5	12 9	14 9	13 9	13 2	13 2	13 2	13 5	14 5	14 9	15 2	15 6	15 2	15 2	14 9
2	12 2	11 5	12 5	12 5	12 2	11 2	9 5	11 8	14 9	14 9	14 9	15 9	16 6	15 6	14 5
3	8 8	5 5	8 5	8 8	9 8	11 5	11 8	11 8	11 8	16 5	16 5	17 2	17 5	17 8	16 5
4[a]	13 5	13 5	13 5	13 8	13 1	12 1	12 8	12 8	13 5	13 5	14 1	17 5	17 2	16 5	14 8
5[a,b]	12 8	12 8	12 4	12 4	12 4	12 8	13 1	13 1	13 5	13 5	13 5	13 8	14 5	14 1	13 5
6[a,b]	12 8	11 1	13 1	10 4	10 1	10 8	11 4	12 1	13 1	13 1	13 5	13 8	14 1	14 1	13 5
7	[12 4	12 4	12 4	12 8	12 8	12 8	13 1	13 1	13 5	13 5	13 1	13 1	13 1	13 1	13 1
8										[13 1	13 5	14 1	16 2	15 1	15 8
9	[14 1	23 6	13 1	13 5	9 7	13 8	12 8	12 8	13 1	13 5	13 1	13 8	14 5	15 8	16 1
10												[14 1	13 5	13 5	13 8
11										[13 1	13 5	13 5	14 1	15 1	13 8
12	[10 4	13 8	10 8	9 4	9 7	9 7	9 7	10 4	10 4	9 4	16 2	26 8	20 2	19 5	16 5
13											[12 4	13 5	15 1	16 2	14 5
14[a]	11 1	11 8	11 4	10 8	9 7	9 7	10 1	10 1	10 1	10 4	13 5	17 2	16 2	16 5	13 1
15[a]	10 8	10 8	10 1	9 7	10 5	9 4	9 4	6 7	10 1	9 7	10 4	10 8	12 8	12 8	12 4
16[b]	9 4	10 1	11 1	10 1	9 7	10 1	4 4	− 0 4	6 0	8 4	13 1	14 1	14 5	13 5	11 4
17[a]	10 1	11 1	10 4	10 8	11 1	11 1	11 4	11 8	11 4	10 8	12 4	13 5	13 1	13 1	13 1
18	3 8	8 7	9 4	9 7	11 8	10 1	6 7	9 7	6 7	11 8	20 2	20 5	19 5	14 8	13 5
19	10 1	12 1	11 8	12 4	11 1	10 8	10 4	10 4	10 1	11 1	12 8	12 8	13 1	13 5	13 1
20[a]	11 0	11 0	12 7	10 3	12 0	12 7	9 0	12 3	12 7	13 7	14 4	15 4	15 7	14 4	13 0
21	12 4	13 7	11 7	12 3	10 7	19 4	7 6	2 6	12 0	46 0	29 4	22 8	20 1	22 1	16 1
22	15 7	10 3	8 6	10 0	13 0	15 7	13 0	10 0	12 0	13 4	13 7	15 4	15 7	15 7	16 1
23	20 4	12 0	13 0	13 0	12 3	12 7	12 7	13 0	13 4	13 7	14 0	14 4	18 7	18 7	15 0
24	9 3	15 4	13 7	12 7	12 7	12 7	13 5	12 3	13 0	12 0	12 7	14 7	14 0	15 4	15 4
25	12 7	13 0	12 7	16 1	16 1	15 4	12 0	12 3	12 0	12 7	13 4	14 7	14 4	13 4	13 7
26	12 7	13 4	12 7	12 7	12 7	12 3	12 0	12 3	12 3	12 0	12 7	12 7	13 4	14 4	14 4
27	13 0	13 4	11 3	12 7	12 7	12 0	9 3	9 7	11 3	12 7	13 7	14 4	14 4	14 0	13 4
28	10 0	12 7	9 3	12 3	11 3	12 7	11 0	10 3	12 3	13 3	12 3	15 4	18 1	16 4	16 7
29[a,b]	13 0	12 7	13 4	13 4	12 7	12 3	12 3	11 7	12 0	12 7	14 0	14 4	14 4	14 4	13 0
20[a,b]	11 7	11 0	10 0	12 7	12 3	12 7	12 7	12 7	12 3	12 7	13 0	13 7	14 7	15 0	15 0
31	12 7	14 4	12 0	11 7	12 3	12 7	12 7	12 3	12 7	12 7	13 0	13 4	15 0	16 1	17 1
Mean	11 8	11 9	11 7	11 9	11 9	12 3	10 9	10 6	11 8	14 0	14 4	16 2	15 5	15 3	14 3
Mean[a]	12 0	11 9	12 0	11 7	11 7	11 6	11 4	11 6	12 1	12 2	13 2	14 3	14 6	14 5	13 6
Mean[b]	11 9	12 0	11 6	11 7	11 7	12 0	12 3	12 4	12 6	12 6	13 0	14 0	14 4	14 2	13 3
1925															
Jan 1	12 7	12 0	10 5	11 3	11 3	11 7	11 7	12 0	12 3	12 3	13 3	15 0	14 3	14 7	14 7
2	12 0	6 2	14 3	11 6	12 3	12 0	10 0	12 0	14 0	12 7	14 0	14 7	15 0	14 3	13 8
3	12 0	12 0	12 0	11 6	12 0	12 0	11 6	12 0	12 3	12 7	13 7	14 3	14 7	14 7	14 3
4[a,b]	14 0	11 6	12 0	11 6	11 3	11 3	12 0	12 0	12 7	12 7	12 7	14 0	14 3	14 0	13 3
5	15 0	14 7	14 3	12 0	11 6	11 6	10 3	11 3	11 6	12 0	12 3	14 3	15 4	15 4	12 3
6	8 6	16 0	5 6	11 3	9 0	9 0	9 6	10 3	11 0	13 3	13 7	14 0	14 3	14 3	14 3
7	11 6	12 3	12 0	11 6	10 0	10 6	10 6	12 0	12 0	13 0	14 3	13 0	14 3	13 3	11 6
8	11 6	11 0	10 3	9 0	8 3	8 3	11 3	14 0	14 0	14 7	14 0	14 3	14 3	14 3	13 7
9[a]	11 6	12 0	11 6	11 6	11 6	12 0	12 0	12 0	12 3	12 3	12 3	12 7	12 7	12 0	12 0
10[a,b]	11 6	11 6	12 3	11 6	12 0	11 3	11 0	11 6	12 3	12 7	12 7	12 7	13 0	12 7	12 7
11[a]	8 6	11 0	11 6	11 3	13 0	12 0	12 7	13 3	13 7	13 7	13 7	14 0	13 7	13 0	13 3
12[a,b]	13 3	11 6	12 3	12 0	12 0	12 0	12 0	12 3	12 3	12 3	12 7	14 3	14 0	13 7	13 3
13	12 0	12 0	12 7	11 3	11 6	12 0	11 6	11 6	11 6	13 0	12 7	13 3	13 7	13 3	13 0
14	5 9	8 3	18 7	8 6	10 3	12 0	11 6	9 3	12 7	15 0	16 0	16 0	15 7	15 7	15 0
15[a]	12 7	13 3	13 3	13 7	14 0	12 0	11 0	11 6	13 7	14 3	14 7	15 7	15 4	15 0	14 3
16[a]	14 3	14 7	14 3	14 0	13 3	12 7	12 7	13 0	13 7	14 3	15 0	15 7	15 7	15 7	15 4
17	15 0	13 7	12 0	11 3	8 3	2 5	12 0	− 8 9	1 9	22 8	21 1	17 7	18 1	32 2	34 6
18	14 7	15 4	11 6	11 6	11 3	11 6	7 6	11 3	15 4	15 7	22 4	22 8	22 1	20 1	21 4
19	16 0	18 7	22 1	28 8	14 3	11 6	13 0	18 5	17 7	24 4	19 1	22 1	34 9	28 2	22 4
20	15 7	32 2	82 7	−20 0	−31 8	−27 0	59 1	79 3	50 7	28 8	33 5	22 1	25 5	24 8	19 4
21	15 7	16 0	19 4	21 4	17 3	14 7	14 7	14 3	16 5	15 5	16 0	16 7	17 5	18 0	22 1
22	7 9	15 0	13 7	14 7	15 0	18 0	14 7	14 7	15 7	15 4	14 7	16 4	17 0	17 0	17 4
23	14 7	16 0	13 3	11 6	10 0	13 0	14 7	15 4	15 4	15 4	15 7	15 7	15 4	15 7	16 0
24	15 0	15 4	18 0	− 2 2	10 0	11 6	11 0	3 6	21 7	17 0	22 4	21 4	18 7	13 7	15 0
25[b]	55 8	7 9	10 0	18 7	21 7	15 0	15 7	15 7	14 7	13 7	14 7	14 7	15 0	15 0	15 4
26[a]	12 7	12 0	15 0	15 0	15 0	14 7	14 0	13 3	13 7	13 7	13 7	14 3	14 7	15 0	15 4
27	14 7	12 0	11 0	8 6	5 6	12 7	15 0	12 7	12 3	12 3	14 0	14 7	15 0	15 4	14 3
28[a,b]	11 6	12 0	11 3	14 0	12 0	12 0	12 0	11 6	12 0	12 7	14 7	15 7	16 4	16 0	15 7
29[a]	13 0	7 9	9 6	13 0	14 3	13 3	15 4	14 3	14 0	14 0	14 0	15 0	16 0	17 0	16 4
30	12 3	12 0	15 4	12 3	14 7	13 0	15 4	13 3	13 0	13 0	14 3	15 0	16 4	16 4	15 7
31	15 0	14 7	14 3	15 4	13 0	12 3	12 3	8 9	15 4	18 0	14 7	14 7	16 0	16 7	16 0
Mean	14 1	13 3	15 4	11 6	10 8	10 7	13 8	13 8	14 6	14 9	15 6	15 7	16 4	16 4	15 9
Mean[a]	12 3	11 8	12 3	12 8	12 8	12 3	12 5	12 5	13 0	13 3	13 6	14 4	14 5	14 4	14 2
Mean[b]	12 5	11 4	12 6	12 7	13 2	12 7	12 9	12 9	13 1	13 1	13 3	14 2	14 5	14 1	14 0

[ ]=Not used in the mean   [a] Ten least disturbed days, means on basis L M T   [b] Five international quiet days, means on basis G M T

Island, December 1, 1924, to May 18, 1925

(The tabular values are average values for successive periods of one hour as indicated local mean time)

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Minimum		Maximum		Range
1924	′	′	′	′	′	′	′	′	′		′	h m	′	h m	′	′
Dec 1	14 2	12 9	12 9	12 9	13 9	14 2	13 9	12 9	11 2	0	13 8	23 03	2 1	1 00	16 6	14 5
2	13 0	12 9	12 2	12 5	12 0	12 9	12 9	11 8	15 2	0	13 2	0 19	4 8	0 39	21 6	16 8
3	15 8	15 1	15 5	15 5	15 5	15 5	15 1	14 5	13 5	1	13 6	1 30	1 7	13 02	19 8	18 1
4[a]	14 5	14 1	13 1	10 9	10 1	12 1	12 4	12 8	12 8	0	13 5	5 46	9 1	13 10	19 2	10 1
5[a,b]	13 5	12 8	12 8	13 5	13 1	13 5	13 1	13 1	12 8	0	13 2	0 12	11 8	12 51	15 5	3 7
6[a,b]	13 1	13 5	13 1	12 8	12 4	12 4	12 8	12 8	12 8	0	12 6	3 35	7 7	2 57	20 2	12 5
7	13 1	13 1	13 5	13 5]												
8	15 1	15 5	13 5	15 1	15 1	13 1	12 4	11 1	12 8]							
9	14 1	13 1	13 8	14 1]												
10	14 1	13 5	13 5	14 8]												
11	13 1	13 1	11 8	10 8	9 7	9 7	10 1	10 8	10 4]							
12	15 8	9 2]														
13	13 5	12 5	10 8	10 8	9 7	10 1	10 4	11 4	11 1]							
14[a]	10 1	10 1	10 8	10 4	10 1	10 4	10 1	10 1	9 7	0	11 4	23 27	5 4	11 07	20 2	14 8
15[a]	10 1	10 1	10 1	10 1	10 1	9 7	10 1	10 1	9 7	0	10 3	6 57	5 4	12 17	16 8	11 4
16[b]	10 8	10 8	10 4	10 1	10 1	10 4	10 8	10 8	11 4	1	10 0	7 54	− 3 2	11 42	16 2	19 4
17[a]	12 8	12 1	12 4	12 8	13 1	10 8	10 4	10 1	8 7	0	11 6	23 24	3 3	11 58	13 8	10 5
18	13 8	13 5	11 4	12 1	10 8	10 8	10 1	10 8	10 4	1	11 7	1 02	3 7	12 00	23 4	19 7
19	12 8	11 8	13 0	12 4	13 0	12 7	18 1	4 6	7 6	1	11 7	22 33	− 23 3	21 34	33 9	57 2
20[a]	12 7	15 0	12 7	12 7	14 4	12 7	12 3	12 0	13 0	0	12 8	6 16	7 6	0 50	20 4	12 8
21	26 2	14 4	10 7	12 7	11 0	2 3	5 4	12 0	12 7	2	15 3	23 06	− 51 3	23 32	76 0	127 3
22	15 4	14 0	13 0	12 3	12 7	13 4	13 4	11 7	12 7	1	13 2	2 46	2 6	0 02	47 0	44 4
23	14 4	14 0	12 7	15 0	14 4	15 4	4 3	15 7	12 3	1	14 0	21 42	− 15 9	21 30	53 1	69 0
24	13 7	13 0	12 7	7 3	12 7	12 7	13 0	13 0	12 7	1	12 9	18 24	1 9	1 10	23 5	21 6
25	12 3	12 7	12 7	12 3	12 3	12 3	13 0	12 7	12 7	1	13 2	6 55	9 3	4 21	22 8	13 5
26[a]	13 4	12 7	12 7	12 3	12 0	8 3	11 0	12 3	12 3	0	12 5	20 33	0 2	12 56	15 4	15 2
27	13 4	13 7	12 7	12 3	12 3	12 3	12 3	5 9	12 7	1	12 3	22 00	− 1 1	23 24	19 4	20 5
28	16 4	15 7	15 4	12 7	12 0	12 7	12 7	11 3	12 7	1	13 2	1 53	5 3	1 22	19 8	14 5
29[a,b]	12 7	12 7	12 7	12 7	13 4	13 7	13 0	13 0	13 4	0	13 1	7 02	10 8	13 28	14 7	4 4
30[a,b]	13 4	13 0	13 0	12 7	12 7	12 7	11 7	13 0	15 4	0	12 9	2 04	6 6	23 40	18 8	12 2
31	14 7	12 0	12 7	12 3	12 3	12 7	3 2	5 3	14 4	1	12 5	21 52	− 14 3	14 03	19 8	34 1
Mean	13 9	13 0	12 6	12 2	12 4	11 9	11 5	11 3	12 2		12 7		− 0 4		24 5	24 9
Mean[a]	12 6	12 6	12 3	12 1	12 1	11 6	11 7	11 9	12 1		12 4					
Mean[b]	12 7	12 6	12 4	12 4	12 3	12 5	12 3	12 5	13 2		12 6					
1925																
Jan 1	14 3	13 8	13 0	13 3	14 8	15 4	14 3	11 8	13 0	0	13 0	22 21	5 9	21 56	18 7	12 8
2	13 0	12 7	12 7	12 3	12 8	12 8	12 0	12 0	11 6	1	12 5	1 16	− 2 5	0 55	18 7	21 2
3	14 0	13 7	11 6	11 3	11 3	11 6	8 6	6 2	9 3	1	12 1	21 55	− 13 3	22 45	23 8	37 1
4[a,b]	12 3	12 0	12 0	11 3	12 0	11 6	12 0	12 7	12 0	0	12 4	2 04	8 6	0 05	17 7	9 1
5	15 4	23 1	16 4	12 7	11 0	11 0	11 3	8 6	9 6	1	13 1	22 53	1 9	17 00	28 8	26 9
6	12 3	12 3	11 3	11 6	11 6	12 3	12 7	7 9	12 0	1	11 6	0 07	− 5 5	1 54	25 7	31 2
7	12 0	12 7	12 0	12 3	12 0	12 3	11 3	8 6	9 6	0	11 9	22 41	5 2	12 07	15 0	9 8
8	13 0	12 7	12 7	12 7	12 0	12 7	12 0	12 0	11 6	0	12 3	4 42	5 2	2 08	18 7	13 5
9[a]	12 0	11 6	12 0	12 7	12 3	12 3	12 3	12 0	12 7	0	12 1	23 17	5 9	16 58	15 0	9 1
10[a,b]	12 0	12 0	12 0	12 0	12 3	12 3	13 0	11 6	11 3	0	12 1	6 21	8 3	2 31	15 4	7 1
11[a]	13 0	12 7	12 3	12 0	12 0	12 7	8 6	12 7	13 3	0	12 4	21 52	1 9	1 17	15 4	13 5
12[a,b]	12 3	12 0	12 0	12 0	12 3	12 7	12 7	12 7	12 7	0	12 6	0 49	11 0	3 00	15 4	4 4
13	12 0	12 0	12 0	12 7	15 0	15 7	9 6	8 3	25 5	1	12 8	23 26	− 15 0	23 44	99 6	114 6
14	14 3	14 7	14 7	13 7	13 0	12 7	12 7	12 3	12 0	1	13 0	1 42	− 25 0	2 25	38 9	63 9
15[a]	13 3	12 7	13 3	13 7	13 7	13 0	14 3	14 3	14 3	0	13 6	6 13	10 0	22 53	18 7	8 7
16[a]	15 0	14 7	14 7	14 7	14 0	14 3	11 6	14 7	15 7	0	14 3	21 44	11 0	22 11	18 7	7 7
17	22 1	18 7	18 7	12 0	14 7	− 1 5	9 3	12 0	16 7	2	14 0	7 30	− 32 5	21 43	49 0	81 5
18	22 1	15 4	15 0	15 0	14 0	11 3	17 0	15 0	15 0	1	15 6	6 50	5 2	10 37	32 2	27 0
19	18 4	17 4	14 7	12 7	12 3	15 0	11 6	15 4	15 0	2	18 5	5 58	7 9	3 16	45 3	37 4
20	18 7	17 0	11 3	8 3	15 0	12 7	8 9	5 9	10 3	2	21 0	5 36	−112 8	7 37	214 1	326 9
21	19 7	19 1	10 4	18 7	15 4	14 7	14 0	13 7	7 6	1	16 6	21 57	5 2	2 52	52 4	47 2
22	17 4	15 4	15 4	15 0	13 7	14 0	15 4	15 7	15 7	1	15 2	0 13	− 11 9	1 03	32 2	44 1
23	16 0	16 4	16 0	17 0	13 7	16 4	15 0	14 0	8 5	1	14 6	23 24	− 25 0	20 23	19 4	44 4
24	18 4	18 0	15 7	11 6	15 0	11 0	− 6 2	21 1	15 0	2	13 8	2 35	− 51 7	22 08	35 2	86 9
25[b]	15 7	15 4	15 0	15 4	15 0	11 6	10 6	12 3	15 0	1	16 2	1 31	4 6	0 19	118 4	113 8
26[a]	15 4	14 7	14 7	14 0	14 3	14 7	15 0	14 7	14 3	0	14 3	1 00	10 6	14 06	15 7	5 1
27	13 0	13 3	13 3	14 0	13 7	13 3	13 7	13 7	13 3	1	13 0	3 06	− 0 1	3 52	22 1	22 2
28[a,b]	17 7	15 0	15 0	15 0	14 3	15 0	15 0	11 3	11 6	0	13 7	2 03	4 6	15 09	18 7	14 1
29[a]	15 7	15 0	15 4	15 4	15 4	15 4	15 0	15 4	13 7	0	14 3	1 16	4 6	13 53	17 4	12 8
30	15 0	15 0	14 7	13 3	13 0	15 4	15 4	12 0	14 3	0	14 2	22 46	5 9	2 26	25 5	19 6
31	14 7	13 3	13 7	14 7	15 0	15 4	15 4	15 4	14 3	1	14 6	7 32	8 3	9 12	29 4	13 1
Mean	15 2	14 7	14 0	13 3	13 4	12 9	12 1	12 4	13 1		13 9		− 5 3		36 2	41 5
Mean[a]	13 9	13 2	13 3	13 3	13 3	13 4	13 0	13 2	13 2		13 2					
Mean[b]	14 1	13 4	13 3	13 1	13 1	12 6	11 8	12 1	12 6		13 1					

[ ] = Not used in the mean [a] Ten least disturbed days, means on basis, L M T [b] Five international quiet days, means on basis, G M T

TABLE 30—*Hourly Values of Declination at Four Pillar*

[0° West Plus Tabular Quantities]

Day	0h–1h	1h–2h	2h–3h	3h–4h	4h–5h	5h–6h	6h–7h	7h–8h	8h–9h	9h–10h	10h–11h	11h–12h	12h–13h	13h–14h	14h–15h
1925	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Feb 1	10 0	12 7	10 4	13 4	13 4	10 7	11 1	11 7	12 1	12 7	13 8	14 1	14 1	14 1	13 8
2	3 6	7 0	14 8	11 7	10 7	12 1	10 4	13 8	15 1	16 5	14 4	13 8	14 1	14 8	14 4
3a,b	12 4	11 4	12 4	13 8	13 1	9 7	11 1	13 4	13 8	13 8	13 4	13 8	14 1	14 4	14 8
4a,b	13 8	13 8	13 4	13 4	13 4	13 4	11 7	12 4	12 7	13 8	14 1	13 8	14 4	15 8	15 8
5a	14 4	13 4	13 4	13 1	13 8	13 1	12 1	13 1	13 1	13 8	13 4	13 4	14 4	15 8	14 8
6	10 4	10 7	9 0	13 1	13 1	13 1	13 4	12 7	11 7	12 4	13 1	14 1	16 5	16 8	17 1
7	11 7	11 4	13 4	17 1	18 5	16 5	11 1	13 4	12 7	13 4	13 4	15 1	16 1	16 1	16 4
8a	13 4	13 8	13 4	13 8	13 4	13 4	13 8	11 1	11 1	13 4	14 1	15 1	14 8	15 4	15 4
9	13 4	11 4	7 4	6 7	3 6	7 0	0 6	4 3	13 8	22 8	46 8	53 5	40 0	30 3	30 6
10	16 1	10 7	10 0	14 8	5 7	6 7	7 0	19 5	12 4	13 8	15 1	17 8	17 1	18 8	17 1
11	14 4	14 4	14 1	14 8	14 8	10 4	11 1	12 7	11 7	14 4	17 1	17 8	20 8	17 8	14 8
12	16 1	14 4	13 4	12 4	10 7	6 7	8 0	6 0	6 7	10 2	15 4	17 1	18 8	19 8	17 1
13	18 8	11 1	7 0	13 8	13 4	10 4	17 1	16 5	12 4	11 1	13 4	17 1	16 5	16 8	16 8
14	16 5	8 7	7 7	10 7	9 7	10 0	4 0	13 4	18 2	13 4	13 4	14 8	17 1	17 5	17 8
15	10 4	7 0	11 1	10 0	15 4	6 7	10 7	13 8	10 4	11 4	12 4	13 4	15 4	16 8	16 1
16a	13 8	12 1	14 1	14 1	13 8	12 1	9 7	13 4	13 4	10 4	11 7	13 4	14 8	16 5	16 8
17	13 4	12 4	20 8	17 1	10 4	10 0	8 0	11 4	10 4	17 5	14 1	16 8	18 1	17 1	15 1
18	18 1	17 4	10 4	0 6	3 0	3 6	10 4	6 3	12 7	23 5	22 8	21 2	19 1	16 5	16 1
19	[13 8	12 4	13 4	10 7	10 4	11 1	10 4	10 0	13 4	13 4	14 1	15 1	16 1	17 1	16 8
20											[35 4	32 4	25 5	24 8	20 1
21a,b	10 7	11 0	11 4	12 4	11 7	10 0	9 7	10 0	12 0	14 4	13 7	13 1	14 1	15 4	14 7
22a,b	11 4	12 0	11 7	11 7	11 7	11 7	11 7	11 7	12 0	12 0	12 4	13 1	14 7	15 1	15 4
23a,b	11 4	12 0	11 4	11 7	11 7	11 4	11 7	11 7	11 0	10 7	12 0	12 7	13 7	14 4	14 7
24a	12 0	12 0	12 4	12 4	12 0	11 7	12 0	12 0	12 0	12 4	13 4	14 7	15 4	15 4	15 4
25	12 0	12 0	11 4	9 7	5 4	− 1 4	− 1 4	− 7 2	− 5 1	1 9	11 7	17 4	18 8	21 8	25 9
26	7 7	5 0	8 0	11 7	12 0	11 7	11 7	11 7	11 7	11 7	12 4	14 4	15 0	15 0	15 4
27a	12 7	12 0	12 0	11 7	12 0	12 4	12 4	12 0	11 7	11 7	12 4	13 4	15 0	15 4	15 4
28	12 0	12 4	12 4	12 0	12 0	11 7	11 7	11 4	11 4	10 4	11 7	11 7	12 4	14 4	15 4
Mean	12 7	11 6	11 8	12 2	11 5	10 2	10 0	11 2	11 6	13 2	15 1	16 4	16 7	16 8	16 7
Mean^a	12 6	12 4	12 6	12 8	12 7	11 9	11 6	12 1	12 3	12 6	13 1	13 6	14 5	15 4	15 3
Mean^b	12 6	12 6	12 5	12 5	12 5	12 3	11 8	12 2	12 4	12 5	13 1	13 3	14 2	15 0	15 1
1925															
Mar 1	10 4	11 4	9 3	9 7	10 0	11 4	12 0	5 0	3 3	8 7	8 7	12 0	16 4	18 1	19 8
2	5 9	9 6	12 0	12 0	12 4	12 4	12 0	13 8	9 3	10 4	10 4	14 7	15 1	15 4	16 8
3	1 9	8 3	8 3	9 6	8 6	8 3	8 6	7 9	8 3	8 6	9 0	9 3	11 1	12 7	13 7
4a	4 9	9 0	9 3	8 6	9 0	9 0	7 6	6 6	5 3	7 6	8 3	8 6	11 3	12 7	12 3
5	8 3	7 9	6 3	5 9	5 9	5 9	6 3	5 2	5 9	5 9	9 3	12 3	12 0	14 7	21 7
6	7 3	8 6	1 9	1 5	− 1 5	− 1 5	2 2	8 6	7 6	8 6	9 3	10 3	12 7	17 0	18 7
7a	8 3	8 6	8 3	8 3	8 3	8 6	8 6	8 6	7 3	7 3	11 3	12 3	14 3	14 3	13 0
8											[10 0	12 0	13 4	15 0	15 0
9										[9 0	10 0	11 7	12 4	13 4	15 4
10	[11 7	9 0	22 1	18 8	18 4	− 1 8	5 9	11 7	13 0	20 8	15 4	16 4	21 5]		[18 4
11										[12 0	12 7	15 4	15 0	15 7	18 8
12a	9 3	8 6	10 3	11 6	14 7	11 0	7 6	7 0	8 3	7 0	7 6	13 0	14 7	16 1	18 8
13a	12 0	14 7	18 4	11 7	10 3	8 6	10 0	8 3	5 9	7 0	11 7	12 7	14 7	16 1	17 7
14a	7 0	9 7	11 3	11 3	10 0	9 0	7 0	5 3	5 3	6 6	11 3	12 7	15 7	16 1	17 4
15	8 0	6 6	9 3	10 7	9 7	9 3	8 3	10 0	6 3	4 9	5 9	10 3	11 7	13 0	15 7
16	76 1	− 4 8	− 1 1	6 7	8 0	11 7	8 6	1 9	8 3	4 9	5 3	8 6	10 7	14 4	16 4
17a	8 0	14 4	9 3	9 7	11 3	8 0	7 0	6 3	10 0	7 3	8 3	11 7	14 7	17 1	17 4
18	[8 6	10 3	11 3	10 3	12 7	12 0	9 0	6 6	10 0	11 7	11 7	12 0	14 7	15 7	16 7
19										[8 6	9 3	10 3	12 0	14 0	15 4
23											[11 3	12 0	15 4	16 7	18 4
24a	8 3	4 9	5 9	8 0	8 6	6 3	8 6	7 0	5 6	6 3	7 3	10 0	12 0	14 0	15 0
25a	10 3	7 6	18 0	7 6	5 9	6 6	5 9	5 6	5 6	5 9	8 3	11 3	13 7	15 7	18 8
26a	5 9	9 0	8 3	9 3	7 3	5 6	3 3	5 3	5 3	8 0	8 6	12 0	15 4	18 8	21 8
27	7 6	3 3	− 0 4	5 3	5 9	5 3	4 9	6 3	8 0	8 6	8 6	11 7	12 4	17 7	19 1
29														[15 0	15 4
30	10 7	8 6	12 4	11 3	4 3	− 4 8	− 4 5	2 2	4 6	7 6	12 7	18 1	17 7	17 1	14 4
31a	8 6	9 0	12 4	8 6	9 0	8 0	5 6	4 6	5 3	7 6	11 3	13 7	16 4	18 1	17 4
Mean	11 5	8 2	8 4	8 8	8 3	7 3	6 8	6 6	6 6	7 3	9 1	11 9	13 8	15 7	17 2
Mean^a	8 3	9 6	10 2	9 5	9 4	8 0	6 4	6 5	6 4	7 1	9 4	11 8	14 3	15 9	17 0

( ) Interpolated [ ] Not used in the mean [a] Ten least disturbed days, means on basis L M T [b] Five international quiet days, means on basis G M T

Island, December 1, 1924, to May 18, 1925—Continued

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15h–16h	16h–17h	17h–18h	18h–19h	19h–20h	20h–21h	21h–22h	22h–23h	23h–24h	Magnetic character	Mean	Minimum			Maximum			Range
1925	′	′	′	′	′	′	′	′	′		′	h	m	′	h	m	′	′
Feb 1	13 4	12 7	13 1	13 1	12 7	13 4	12 4	8 4	3 3	1	12 1	23	21	− 6 5	1	38	17 1	23 6
2	13 1	12 4	12 7	13 4	13 8	13 8	13 8	13 4	11 4	1	12 7	0	50	−13 5	0	22	31 3	44 8
3[a,b]	14 1	13 8	13 4	13 8	14 1	14 4	14 4	14 1	13 8	0	13 4	5	36	7 0	3	09	22 8	15 8
4[a,b]	15 8	13 8	13 4	13 8	13 8	13 8	13 8	13 8	12 7	0	13 8	23	27	3 0	15	16	17 5	14 5
5[a]	14 4	13 4	13 4	13 4	14 1	14 1	13 8	14 8	11 4	0	13 7	23	29	8 7	4	42	17 1	8 4
6	17 1	16 5	14 8	13 8	13 8	13 8	10 4	11 7	13 1	1	13 4	22	00	− 9 8	1	21	28 9	38 7
7	15 4	15 1	13 8	14 1	14 1	14 8	15 4	15 1	11 4	1	14 4	23	11	6 7	4	50	23 1	16 4
8[a]	15 4	16 5	14 8	13 8	13 8	14 1	14 1	14 4	13 8	0	14 0	9	04	7 0	9	11	17 8	10 8
9	23 5	13 4	− 6 5	− 8 8	13 4	13 8	9 7	10 4	20 5	2	15 9	18	58	−50 6	10	54	63 6	114 2
10	17 5	16 8	15 8	14 8	16 5	14 8	14 4	14 1	13 8	1	14 2	5	55	0 9	0	07	37 3	36 4
11	17 1	17 1	16 8	16 8	14 8	11 7	16 5	13 8	12 7	1	14 9	5	51	7 7	12	38	25 9	18 2
12	16 8	15 4	16 1	15 1	14 8	16 8	16 5	14 1	6 3	1	13 5	23	42	− 3 1	1	39	21 2	24 3
13	17 1	17 1	14 4	16 1	17 5	18 5	16 8	13 8	13 1	1	14 9	4	38	− 4 1	4	08	48 1	52 2
14	16 8	16 5	15 1	15 1	13 1	12 1	13 4	13 1	7 3	1	13 1	23	45	− 6 5	8	15	23 9	30 4
15	16 5	14 2	15 8	14 4	16 8	13 8	13 8	13 4	13 1	1	13 0	0	32	− 6 5	0	08	27 2	33 7
16[a]	15 8	14 1	14 1	13 8	13 8	13 8	13 8	14 1	13 8	0	13 6	6	58	8 4	2	27	20 1	11 7
17	17 1	17 1	17 1	16 5	14 1	13 4	12 1	10 7	13 1	1	14 3	23	25	5 7	2	58	35 0	29 3
18	11 8	15 1	14 8	13 8	13 8	11 1	13 4	13 8	13 4	1	13 6	4	03	−10 5	0	17	34 6	45 1
19	15 1	16 1]																
20	18 8	20 5	17 1	14 7	12 0	8 7	11 0	8 7	9 7]									
21[a,b]	13 7	13 7	12 4	12 7	12 7	13 1	14 4	13 1	12 7	0	12 6	7	40	9 3	13	10	15 8	6 5
22[a,b]	15 1	14 1	13 7	12 7	12 7	12 7	7 0	8 7	11 4	1	12 3	21	54	− 3 8	14	12	15 8	19 6
23[a,b]	14 0	13 1	13 1	12 0	12 4	10 7	11 4	11 4	12 0	0	12 2	21	49	8 7	22	30	15 4	6 7
24[a]	15 4	14 7	13 7	12 7	12 7	12 7	12 4	12 0	12 0	0	13 1	6	10	11 4	15	21	15 8	4 4
25	22 2	19 8	19 5	16 4	1 9	− 0 4	17 4	4 3	17 8	2	10 5	20	19	−25 7	20	58	69 3	95 0
26	15 1	15 0	14 7	14 4	14 4	14 1	13 7	13 7	13 4	1	12 7	0	50	−17 2	0	16	32 3	49 5
27[a]	15 1	14 7	13 4	13 1	13 1	12 7	12 7	12 4	12 4	0	13 0	8	00	11 4	14	30	15 8	4 4
28	19 1	20 5	18 8	12 0	12 7	12 0	11 0	− 4 8	9 0	1	12 2	22	48	−28 7	17	02	22 2	50 9
Mean	16 2	15 3	13 9	13 2	13 5	13 1	13 4	11 8	12 3		13 4			− 3 5			27 5	31 0
Mean[a]	14 9	14 2	13 4	13 2	13 3	13 2	12 8	12 9	12 6		13 2							
Mean[b]	14 5	13 8	13 0	13 0	13 1	12 9	12 2	12 2	12 5		13 0							
1925																		
Mar 1	19 8	21 2	21 5	24 5	15 4	11 0	9 0	10 4	5 0	1	12 8	23	38	− 5 5	19	04	31 6	37 1
2	16 1	15 4	11 3	10 3	10 3	8 9	9 3	8 6	7 6	1	11 7	1	16	−13 2	14	52	19 8	33 0
3	12 3	11 3	10 0	10 3	8 6	8 9	8 3	6 9	4 9	1	8 9	0	47	− 7 6	14	26	15 0	22 6
4[a]	12 3	11 6	11 3	10 6	10 0	10 0	9 3	9 6	9 6	0	9 4	0	43	0 5	1	16	18 4	17 9
5	18 7	18 7	17 4	15 0	9 3	11 0	3 6	11 0	1 5	1	10 0	23	39	− 9 6	14	21	25 5	35 1
6	15 8	(14 7)	12 7	11 3	9 3	9 3	10 0	10 0	8 6	1	8 9	4	36	− 6 9	0	08	31 2	38 1
7[a]	12 0	(11 0)	10 3	9 0	8 3	8 6	7 9	(8 3)	(8 3)	0	9 6	9	28	1 9	14	19	15 4	13 5
8	15 0	11 4]																
9	15 7	15 4	13 0	15 7	12 0	2 6	9 0	4 9	12 0]									
10	11 4	14 7]																
11	21 5	12 4	12 0	14 4	12 4	11 7	8 6	11 7	11 7]									
12[a]	15 7	15 0	12 7	11 7	9 3	6 7	11 3	11 0	9 3	1	11 2	9	20	1 9	14	24	21 5	19 6
13[a]	15 4	14 7	9 3	11 3	11 7	8 3	5 6	11 7	3 9	1	11 3	23	50	− 4 8	2	16	25 5	30 3
14[a]	17 4	16 1	15 4	14 4	9 3	5 9	11 3	9 3	10 4	1	11 1	0	05	− 4 8	15	58	19 4	24 2
15	15 7	15 4	15 4	12 7	12 7	14 0	− 4 8	−10 2	14 0	2	9 4	22	12	−25 6	22	48	80 0	105 6
16	17 1	15 7	15 1	12 0	− 1 1	5 3	12 0	18 4	5 6	2	11 5	1	24	−35 1	0	58	190 5	225 6
17[a]	16 7	15 4	12 7	10 7	12 0	12 0	12 0	12 0	8 3	0	11 3	9	35	5 3	1	43	24 8	19 5
18	15 7	15 4]																
19	15 1	15 0]																
23	19 4	20 8	18 8	12 0	8 3	1 6	5 9	13 4	2 2]									
24[a]	13 9	12 4	11 7	11 7	11 3	11 7	10 0	9 7	9 3	1	9 6	0	33	−27 7	0	22	22 6	50 3
25[a]	19 1	16 4	14 0	12 0	11 7	10 3	12 0	13 4	14 7	0	10 9	8	18	4 6	23	30	21 8	17 2
26[a]	18 8	17 1	15 4	14 0	12 0	8 6	11 0	11 3	9 0	0	10 9	0	02	− 2 5	14	32	22 1	24 6
27	17 3	(15 4)	13 4	11 3	11 3	11 0	11 3	7 6	6 6	1	9 6	1	56	−10 2	1	30	30 9	41 1
29	15 4	14 0	12 4	11 7	11 7	11 7	11 3	9 0	10 7]									
30	14 4	13 7	12 4	11 7	11 3	12 0	11 7	11 3	9 7	1	10 0	5	01	− 8 5	2	43	35 6	44 1
31[a]	16 1	14 7	12 7	14 0	12 0	11 7	11 3	10 7	9 7	0	11 2	7	56	3 9	2	27	22 1	18 2
Mean	16 0	15 2	13 4	12 6	10 2	9 7	9 1	9 5	8 2		10 5			− 7 6			35 5	43 0
Mean[a]	15 7	14 1	12 6	11 9	10 8	10 2	10 2	10 7	9 2		10 6							

( ) Interpolated [ ] Not used in the mean [a] Ten least disturbed days, means on basis L M T [b] Five international quiet days, means on basis G M T

TABLE 30—*Hourly Values of Declination at Four Pillar*

[0° West Plus Tabular Quantities]

Day	0h–1h	1h–2h	2h–3h	3h–4h	4h–5h	5h–6h	6h–7h	7h–8h	8h–9h	9h–10h	10h–11h	11h–12h	12h–13h	13h–14h	14h–15h
1925	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
Apr 1	[7 6	9 3	11 0	10 3	9 0	7 6	5 6	6 6	7 0	8 3	11 3	12 7	17 1	18 8]	
2	[18 8	4 6	8 3	1 9	2 2	4 6]									
3												[16 1	22 1	28 2	26 8
4	22 8	18 8	28 9	22 1	21 5	35 6	18 0	4 6	7 0	9 7	10 3	13 4	17 1	18 1	18 1
5	8 6	9 0	8 6	8 3	8 3	7 0	6 6	5 3	5 3	5 6	8 0	11 3	15 0	18 8	18 8
6	4 9	4 9	8 3	4 9	1 9	4 6	5 3	8 6	8 0	11 3	12 0	13 7	15 0	16 1	17 7
7	15 4	12 0	20 4	10 0	16 4	12 0	7 0	7 0	6 9	12 0	12 0	15 7	18 8	20 4	18 4
8	7 3	8 3	8 0	8 3	8 6	11 7	8 6	5 6	5 3	11 7	18 1	13 0	18 1	17 7	18 8
9	11 7	8 0	8 0	6 3	5 3	4 6	5 3	5 3	5 3	8 0	7 3	12 0	18 1	22 1	19 8
10	12 0	11 3	8 0	7 3	8 0	7 6	5 6	5 3	11 7	16 4	21 8	25 1	22 1	14 7	8 6
11	9 3	9 0	15 4	16 4	5 9	9 0	8 3	12 0	14 4	14 4	18 8	20 1	18 4	15 4	18 4
12	10 3	9 7	9 0	9 3	12 0	12 0	3 9	8 6	8 0	8 3	8 6	12 0	15 0	22 1	18 8
13	[11 3	26 5	14 7	13 0	12 7	32 2	5 9	8 0	8 3	8 6	8 6	12 0	11 3	12 7	18 1
14											[6 7	10 4	14 8	16 5	18 5
15	9 4	9 1	9 1	7 8	6 4	6 1	5 7	3 4	4 1	5 7	7 4	9 8	12 8	17 2	21 6
16	5 7	6 1	6 4	9 8	9 8	22 6	− 2 0	16 2	22 9	13 1	3 0	9 8	13 5	16 5	19 9
17	5 7	6 4	9 1	6 4	6 7	6 7	5 7	2 7	3 7	5 4	6 4	9 8	13 1	16 5	18 9
18	[11 8	10 4	10 4	8 1	4 1	4 7	1 0	1 4	1 4	6 7	10 4	11 5	16 5	16 5	20 9
20											[5 4	4 4	8 4	12 1	17 9
21	5 1	7 8	19 2	15 2	− 9 4	1 0	− 2 0	2 9	7 8	5 1	7 8	9 8	15 2	20 9	17 5
22	[12 1	8 8	8 8	10 5	8 1	3 4	4 4	7 1	10 1	10 5	13 5	14 5	16 5	18 9	20 9
23												[13 5	15 1	18 5	21 2
24	10 8	11 1	10 5	8 8	7 8	7 4	7 8	8 4	10 8	13 2	14 5	17 9	20 7	22 0	24 6
25	11 1	13 8	14 5	10 8	8 4	8 4	8 1	7 1	8 8	8 1	11 1	17 5	19 6	22 3	25 3
26	14 2	14 2	11 8	10 8	9 4	7 8	5 7	7 1	7 4	8 1	7 4	14 5	20 2	22 3	24 6
27	7 8	23 9	14 8	11 1	10 8	7 8	7 8	7 1	9 1	11 1	14 5	18 5	21 2	23 9	24 3
28	13 8	13 5	14 5	17 9	7 1	− 1 7	7 4	4 1	7 8	7 1	11 1	14 2	14 5	17 9	18 2
29	14 5	12 5	11 8	10 5	8 4	7 8	7 1	7 1	8 8	8 4	14 5	18 2	24 6	23 9	21 9
30	11 1	10 5	9 1	7 4	4 4	4 4	4 4	5 7	3 4	7 1	7 8	9 4	13 8	17 2	18 5
Mean	10 6	10 6	12 3	10 5	7 9	9 1	6 2	6 7	8 3	9 5	11 1	14 3	17 3	19 3	19 8
1925															
May 1	9 4	10 8	7 8	8 1	6 7	5 4	7 4	7 8	8 1	10 5	12 1	14 5	16 5	16 2	16 2
2	10 8	9 8	7 8	6 7	6 1	5 7	5 1	4 7	8 1	10 8	11 8	12 5	14 5	15 8	17 9
3	7 8	7 8	6 7	4 4	3 4	2 0	1 0	1 0	3 7	5 4	7 8	10 8	13 1	15 2	17 2
4	[7 8	7 1	4 4	1 7	0 7	− 0 7	− 0 3	2 0	4 1	2 7	5 1	15 2	21 6	22 2]	
5											[25 3	22 9]			
6	[26 6	11 1	8 8	10 1	5 7	5 4	6 1	8 4	8 4]						
7	[8 1	12 1	12 5	8 7	2 7	1 3	2 7	2 7	2 7]						
8	7 7	8 4	6 7	2 7	2 7	0 7	− 0 7	2 0	5 4	9 8	13 8	13 5	13 5	15 5	12 1
9	[15 1	7 4	8 1	2 7	5 4	2 0	− 1 4]								
10	22 1	22 1	15 4	22 4	9 0	10 0	10 3	2 9	8 0	12 7	14 7	16 1	19 8	20 8	20 1
11	14 0	13 7	12 0	9 0	8 6	6 3	7 0	6 3	7 0	9 7	12 0	15 7	17 1	18 1	18 4
12	12 7	12 7	12 0	9 6	6 6	3 9	2 6	3 9	5 9	6 3	9 0	15 0	16 1	19 1	19 4
13	[12 3	12 0	11 7	9 3	5 9	3 9	3 6]								
14	11 3	10 7	9 3	6 6	5 3	3 2	2 6	3 6	5 6	7 3	10 0	12 7	17 1	19 4	19 4
15	[11 0	9 6	8 6	5 9	3 2	2 9	2 6	2 6	4 9	5 6	9 3	13 0	15 7	16 1	18 4
16															
17	9 0	7 6	5 4	3 2	1 6	− 0 5	− 0 5	1 9	3 6	7 6	9 7	12 0	12 0	12 7	13 7
18	[10 3	9 6	8 9	6 3	4 6	2 6	2 2	3 6	5 9	9 7	12 7	13 4	13 0	13 4	25 5
Mean	11 6	11 5	9 2	8 1	5 6	4 1	3 9	3 8	6 2	8 9	11 2	13 6	15 5	17 0	17 2

[ ] = Not used in the mean

mean hourly declination is, therefore, of the order of 1′, but when the curve has a ragged appearance the accuracy is considerably less In the tables the values have been entered to one-tenth of a minute.

Table 30 contains the mean hourly values of the declination centered on the half-hour and referred to L M T The longitude of this station is 162° 30′ east of Greenwich, corresponding to a time difference from Greenwich of $10^h\ 50^m\ 00^s$. Disregarding the difference of 10 minutes, the tables may be regarded as giving the mean hourly values referred to G M. T by subtracting 11 hours from the time expressed as L M. T

Table 31 contains the results of eye-observations in October and November The values in this table are derived from readings which were taken during 10 minutes before and 10 minutes after every half-hour The braces indicate how the mean values to the right have been computed. In computing the mean values at the bottom, the

Island, December 1, 1924, to May 18, 1925—Concluded

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Day	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Magnetic character	Mean	Minimum		Maximum		Range
1925	′	′	′	′	′	′	′	′	′		′	h m	′	h m	′	′
Apr 1			[15 0	12 4	12 0	4 9	4 3	12 4	11 7							
2			[19 8	16 1	12 0	9 3	9 3	9 7]								
3	25 5	19 8	22 1	20 1	12 0	5 9	− 1 1	34 9	16 7]							
4	16 4	15 0	12 0	11 7	11 7	11 3	11 3	11 3	11 0	2	15 7	3 35	−42 2	3 04	82 8	125 0
5	17 4	15 4	16 1	14 4	13 0	−31 8	1 9	13 7	7 0	1	8 8	20 56	−54 3	21 58	25 5	79 8
6	17 4	15 4	14 4	12 0	12 0	11 3	12 0	5 3	1 2	1	9 9	0 01	−57 0	0 06	42 3	99 3
7	19 1	12 0	19 4	8 6	1 6	12 7	11 7	9 3	8 3	1	12 8	19 04	−14 9	2 30	45 0	59 9
8	16 4	16 1	15 4	14 7	15 4	8 6	2 9	12 0	9 0	1	11 6	21 45	− 4 8	13 06	25 5	30 3
9	22 1	15 4	15 4	14 7	5 3	5 3	− 1 1	35 3	− 0 5	1	10 8	22 54	−36 8	22 22	117 1	153 9
10	14 1	18 4	16 1	12 0	8 6	5 3	7 3	12 0	18 4	1	12 4	21 05	0 6	11 04	32 2	31 6
11	18 8	14 4	16 1	14 7	11 0	7 0	− 4 2	18 8	8 6	1	12 9	21 43	−14 9	22 55	82 8	97,7
12	18 1	19 4	16 4	15 0	12 0	9 0	1 2	1 9	8 3	1	11 2	22 34	−15 6	13 15	25 8	41 4
13	18 8	17 1]														
14	19 9	18 9	16 5	12 5	9 4	7 4	9 1	9 8	9 4]							
15	21 9	19 9	16 5	13 1	10 8	9 4	8 8	9 4	6 4	0	10 5	8 07	0 3	15 00	23 3	23 0
16	19 5	19 5	17 9	10 4	9 4	− 2 4	13 8	9 8	9 8	1	11 7	20 55	−54 9	5 13	57 6	112 5
17	18 9	17 2	14 2	12 1	10 1	9 4	5 1	8 1	10 4	0	9 5	21 10	0 3	15 00	19 2	18 9
18	19 9	18 9]														
20	18 2	17 2	17 5	14 5	11 5	10 8	5 4	8 4	7 1]							
21	17 9	17 9	17 9	16 5	15 5	14 2	11 8	14 5	13 8	1	11 0	4 14	−31 0	3 12	42 5	73 5
22	21 2	20 9	17 5	14 5]												
23	21 0	20 9	17 9	14 8	7 8	11 1	12 1	11 8	8 8]							
24	24 6	23 6	19 2	17 2	16 2	13 8	14 5	11 8	11 8	0	14 6	5 45	5 8	15 48	26 0	20 2
25	24 6	22 6	18 0	17 2	14 5	14 5	12 2	11 5	13 8	0	14 4	7 37	2 7	14 40	27 5	24 8
26	24 3	21 2	17 2	14 5	14 2	13 8	14 2	12 1	11 8	0	13 7	6 35	4 4	15 00	24 6	20 2
27	23 9	21 2	17 0	14 5	14 2	14 5	14 2	14 8	14 5	1	15 1	0 44	− 1 7	1 39	44 8	46 5
28	18 2	17 0	15 5	14 5	13 5	12 5	13 2	15 2	14 2	1	12 6	4 33	−37 0	4 00	42 1	79 1
29	27 6	21 9	12 8	15 2	11 1	13 8	10 5	14 2	11 8	1	14 2	19 43	5 8	18 50	33 0	27 2
30	19 6	18 5	17 9	17 2	14 5	11 2	10 2	7 8	7 8	0	10 8	8 55	− 0 7	15 50	20 6	21 3
Mean	20 0	18 1	16 4	14 0	11 7	8 2	8 6	12 4	9 9		12 2		−17 3		42 0	59 3
1925																
May 1	16 5	10 5	15 2	14 2	10 8	6 7	12 8	10 5	10 8	0	11 3	21 05	1 0	21 13	24 6	23 6
2	17 9	17 9	14 5	12 8	9 4	8 1	7 8	7 8	7 8	0	10 5	6 04	4 1	15 20	18 2	14 1
3	17 9	16 5	12 5	10 8	8 4	8 1	8 1	7 8	7 8	0	8 6	6 04	0 4	15 30	18 2	17 8
4																
5			[18 2	−14 2	12 5	−14 8	3 4	9 1	25 6]							
6				[13 8	9 8	9 8	10 1	8 8	9 4]							
7			[13 8	12 1	10 8	10 1	8 8	1 7	10 4]							
8	12 1	11 5	8 1	9 4	9 1	6 4	5 0	7 1	− 4 7	1	7 4	23 19	−18 2	13 22	19 6	37 8
9			[12 7	7 6	8 0	9 3	13 0	15 4	15 4]							
10	19 8	18 8	16 1	13 4	10 7	9 7	10 3	11 7	12 4	1	14 6	4 12	− 0 8	0 55	65 9	66 7
11	18 1	16 1	14 0	12 3	11 0	11 7	11 0	11 0	12 0	0	12 2	7 37	5 6	14 58	19 1	13 5
12	18 4	16 1	13 0	11 3	9 3	9 3	9 3	9 7	10 7	0	10 9	6 11	2 2	14 04	19 8	17 6
13			[14 0	12 0	11 3	9 7	9 7	10 7	11 3]							
14	17 8	16 1	13 0	10 3	11 0	10 3	9 7	10 0	11 7	0	10 6	6 52	2 2	13 17	20 4	18 2
15	16 4	15 4]														
16			[9 7	8 6	6 3	6 3	6 3	7 0	8 6]							
17	14 7	15 0	16 1	13 7	13 4	12 3	12 3	12 3	11 3	0	9 2	5 38	− 0 8	17 30	16 4	17 2
18	19 8	22 1]														
Mean	17 0	16 1	13 6	12 0	10 3	9 2	9 6	9 8	8 9		10 6		0 5		24 7	25 2

[ ] = Not used in the mean

two broken series of October 22 and November 14 have been omitted. The other tables contain the results of the registrations The mean values to the right and at the bottom have been computed from the days for which complete data for 24 hours were available

(5) MEAN MONTHLY VALUES OF DECLINATION

The mean monthly values of declination are found in Table 32 The left part of the table contains the mean declination derived from all days and from the days which in each month have been given the character-numbers 0, 1, and 2, while the number of days within the various groups are given to the right No classification has been attempted for the days in October and November, when the diurnal variation was determined by eye-observations, but the mean values from the days have been included in the mean of all days.

TABLE 31—*Hourly Values of Declination at Four Pillar Island for October and November 1924, from Eye-Observations, 0° West Plus Tabular Quantities*

[The tabular values are average values for 20 minutes at the middle of the hour as indicated local mean time]

Date	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h
1924	′	′	′	′	′	′	′	′	′	′	′	′	′
Oct 9													
10	13 5	13 1	12 6	11 6	11 3	13 1	9 5	13 3	14 5	12 1	12 3	14 3	15 9
13										9 7	11 4	11 6	15 7
14	12 2	12 2	12 1	11 5	10 6	11 1	10 5	10 1	10 6	10 9			
16										9 7	12 5	13 9	18 1
17	12 2	12 6	11 6	11 0	10 5	10 4	10 3	8 1	7 4	10 8			
22										10 3	9 8	14 6	19 9
27													10 7
28	6 3	− 1 0	7 9	1 8	3 2	− 4 3	3 1	7 1	26 9	14 2	27 7	25 5	21 7
Nov 4													17 7
5	9 9	8 4	8 5	9 2	8 9	10 7	11 8	8 1	11 6	11 7	12 8	12 1	11 3
7													19 3
8	8 4	8 1	7 5	7 3	7 4	7 5	7 7	8 7	9 3	10 7	10 9	12 2	11 2
10													15 3
11	1 7	1 2	7 6	4 5	6 7	2 9	1 1	6 4	16 3	11 9	19 3	19 5	20 3
14										17 8	20 2	33 2	14 1
Mean	9 2	7 8	9 7	8 1	8 4	7 3	7 7	8 8	13 8	11 3	15 3	15 6	16 1

Date	13^h–14^h	14^h–15^h	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Mean
1924	′	′	′	′	′	′	′	′	′	′	′	′
Oct 9		19 2	17 5	15 2	14 1	13 0	4 1	13 9	13 0	13 9	14 3	13 5
10	16 5	16 9										
13	16 5	16 9	15 7	13 5	12 1	12 2	12 3	12 1	12 8	14 3	13 2	12 5
14												
16	18 7	14 7	13 6	13 5	11 1	14 1	13 4	14 2	15 5	13 5	12 6	12 6
17												
22	16 9	15 5	17 3	14 6	13 5	11 0	11 1	7 2	1 9			
27	10 7	10 5	11 5	10 8	11 9	11 6	12 4	12 4	12 0	10 9	9 1	11 2
28	16 7	12 1										
Nov 4	14 9	13 0	12 5	8 7	9 7	10 0	9 9	9 4	9 4	8 7	10 5	10 8
5												
7	20 1	15 6	16 7	14 0	12 5	13 0	11 7	4 0	−10 8	6 6	9 7	10 0
8												
10	12 9	12 7	10 1	9 9	10 8	9 2	11 7	9 4	3 9	− 9 2	6 6	8 9
11												
14	18 0	15 7	13 7	14 1								
Mean	15 9	14 6	13 9	12 2	11 7	11 9	10 8	10 8	8 0	8 4	10 9	11 2

TABLE 32—*Mean Monthly Values of Declination at Four Pillar Island*

Month	Mean declination 0° west +				Number of days			
	All days	Days with character-number			All days	Days with character-number		
		0	1	2		0	1	2
1924	′	′	′	′				
October–November	11 2				7			
December	12 7	12 6	12 6	15 3	24	12	11	1
1925								
January	13 9	13 1	13 9	16 8	31	14	13	4
February	13 4	13 6	13 4	13 2	26	9	15	2
March	10 5	10 5	10 5	10 4	19	6	11	2
April	12 2	12 2	11 9	15 7	20	6	13	1
May	10 6	10 5	11 0		9	7	2	0
Means and sums	12 5	12 3	12 5	14 6	136	54	65	10

The series is far too short to permit drawing any conclusion regarding annual variation of the declination or to give any information regarding the secular change The latter is, however, about $-8'$ per year at this station, according to the results in the preceding report The mean value derived from all daily means is, according to the table, $D=0° 12'.5$ west for the epoch 1925 2.

The grouping of the days according to the magnetic character fails to reveal any characteristic difference between the mean value of the declination for quiet and for disturbed days The mean value is 2′3 more westerly for the disturbed than for the quiet days, but this difference is too small to be given any weight, considering the small number of disturbed days

(6) DIURNAL VARIATION OF DECLINATION

The observations at the station off Four Pillar Island are still more incomplete than those at Cape Chelyuskin and, therefore, must be treated more briefly It is possible, however, also, at this station to show the characteristic features of the diurnal variation and the influence of the disturbances by discussing the mean hourly values derived from all days and from days with character-numbers 0, 1, and 2 The discussion will be confined to the diurnal variation referred to L. M T.

(7) DIURNAL VARIATION DERIVED FROM ALL DAYS

Table 33 contains the mean hourly departures from the mean value of the month derived from all days from October 1924 to May 1925. It may again be noted that the values for October and November 1924 which are joined in one group are the results of eye-observations on 7 days, while the values for the other months are obtained from continuous records From Table 32 it is seen that the number of days is fairly satisfactory, except for May, which is represented by 9 days only. No corrections for non-cyclic changes have been applied to the values in tables. The values, except for October-November and March, are sufficiently complete to permit the computation of the non-cyclic change which, since we are dealing with values centered on the half-hour, may be defined as the algebraic excess of the value at 0^h to 1^h on one day over the value 0^h to 1^h on the preceding day, or the mean of $(0^h-1^h)_2-(0^h-1^h)_1$, where the indices 2 and 1 refer to two consecutive days. For the months from which a sufficient number of observations are available, we find the following mean values of the non-cyclic change

Month	Dec	Jan	Feb	Apr	May
Non-cyclic change	+0′07	−0′09	+0′14	−0′18	−0′33

These values are so small that the correction for non-cyclic change is of no importance

At the bottom of Table 33 are entered the mean values for the two periods, October to March and October to May, the first representing the winter and the second the entire period of the observations. In forming the means, the combined values for the two months October and November have been given the same weight as the values entered for the single months, because they are derived from very few observations

The characteristic features of the diurnal variation are seen from the last line in Table 33 or from Figure 23, in which the mean values for the entire period are represented graphically. The curve which is plotted in this figure has been computed from the results of the harmonic analysis. We find a rapid fall of west declination between 2^h and 6^h to the morning minimum, which occurs at about 6^h, and a rapid rise between 6^h and 14^h. The primary maximum at 14^h is very marked and is followed by a secondary minimum at 21^h and a secondary maximum at about 1^h.

Within the single months we find the same characteristic features and also an indication of the annual periodicity in the character of the diurnal variation. It is evident that

the extreme values are reached earlier in the winter than in the spring, and that the range of the variation and the average departure have a minimum in winter The change in the range from month to month is so regular that it seems possible to derive the mean summer and mean annual ranges and average departures even from this short series In

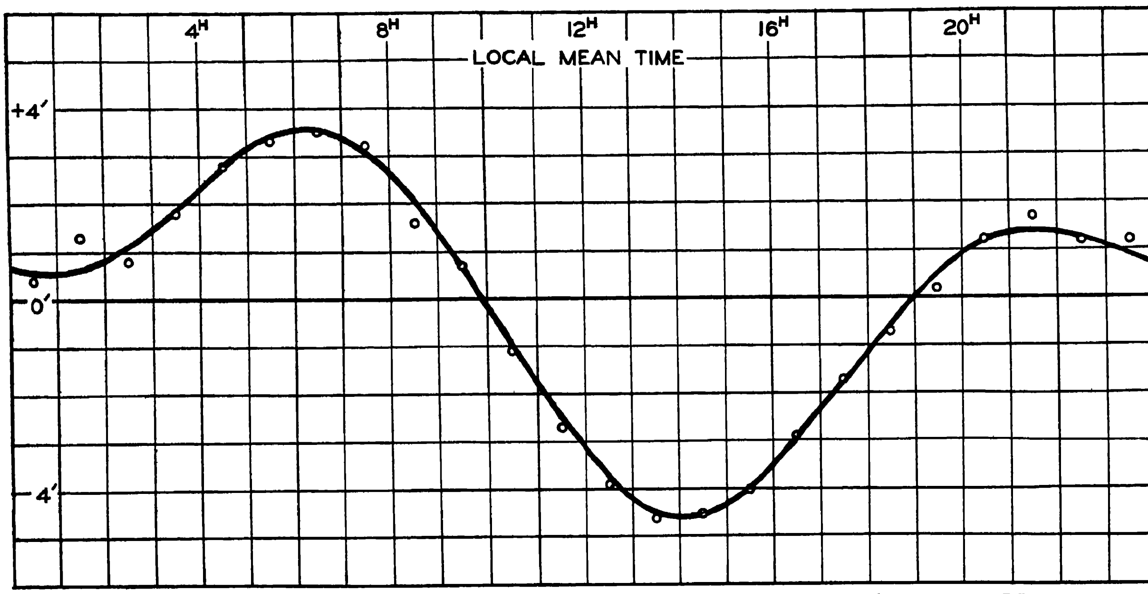


FIG 23—Diurnal variation of declination at Four Pillar Island, all days, October 1924 to May 1925

TABLE 33—*Diurnal Inequality of Declination at Four Pillar Island (hourly departures[a] from mean values)*

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Month	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h
	′	′	′	′	′	′	′	′	′	′	′	′	′
1924													
Oct-Nov	+2 0	+3 4	+1 5	+3 1	+2 8	+3 9	+3 5	+2 4	−2 6	−0 1	−4 1	−4 4	−4 9
December	+0 9	+0 8	+1 0	+0 8	+0 8	+0 4	+1 8	+2 1	+0 9	−1 3	−1 7	−2 5	−2 8
1925													
January	−0 2	+0 6	−1 5	+2 3	+3 1	+3 2	+0 1	+0 1	−0 7	−1 0	−1 7	−1 8	−2 5
February	+0 7	+1 8	+1 6	+1 2	+1 9	+3 2	+3 4	+2 2	+1 8	+0 2	−1 7	−3 0	−3 3
March	−1 0	+2 3	+2 1	+1 7	+2 2	+3 2	+3 7	+3 9	+3 9	+3 2	+1 4	−1 4	−3 3
April	+1 6	+1 6	−0 1	+1 7	+4 3	+3 1	+6 0	+5 5	+3 9	+2 7	+1 1	−2 1	−5 1
May	−1 0	−0 9	+1 4	+2 5	+5 0	+6 5	+6 7	+6 8	+4 4	+1 7	−0 6	−3 0	−4 9
October to March	+0 4	+1 7	+0 9	+1 8	+2 1	+2 7	+2 5	+2 1	+0 6	+0 2	−1 6	−2 6	−3 4
October to May	+0 4	+1 3	+0 8	+1 8	+2 8	+3 3	+3 5	+3 2	+1 6	+0 7	−1 1	−2 7	−3 9

Month	13^h–14^h	14^h–15^h	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Range	Average departure
	′	′	′	′	′	′	′	′	′	′	′	′	′
1924													
Oct-Nov	−4 7	−3 4	−2 7	−1 0	−0 5	−0 7	+0 4	+0 4	+3 2	+2 8	+0 3	8 8	2 45
December	−2 6	−1 6	−1 2	−0 3	+0 1	+0 5	+0 3	+0 8	+1 2	+1 4	+0 5	4 9	1 26
1925													
January	−2 5	−2 0	−1 3	−0 8	−0 1	+0 6	+0 5	+1 0	+1 8	+1 5	+0 8	5 5	1 30
February	−3 4	−3 3	−2 8	−1 9	−0 5	+0 2	−0 1	+0 3	0 0	+1 6	+1 1	6 8	1 72
March	−5 2	−6 7	−5 5	−4 7	−2 9	−2 1	+0 3	+0 8	+1 4	+1 0	+2 3	10 6	2 76
April	−7 1	−7 6	−7 8	−5 9	−4 2	−1 8	+0 5	+4 0	+3 6	−0 2	+2 3	13 8	3 54
May	−6 4	−6 6	−6 4	−5 5	−3 0	−1 4	+0 3	+1 4	+1 0	+0 8	+1 7	13 4	3 37
October to March	−3 7	−3 4	−2 7	−1 8	−0 8	−0 3	+0 3	+0 6	+1 5	+1 6	+1 0	6 4	1 68
October to May	−4 6	−4 5	−4 0	−2 9	−1 7	−0 7	+0 2	+1 2	+1 7	+1 2	+1 2	8 1	2 12

[a] Plus sign indicates departure to eastward and minus sign departure to westward from mean

Figure 24 the ranges and average departures for the various months are entered and a smooth curve drawn representing the annual variation, assuming that both range and average departure reach a maximum in the latter part of June and a minimum at the end of December From these curves we find that the means of the monthly ranges for the periods October to March and April to September are 7′5 and 13′9, respectively, and that the corresponding values for the average departures are 1′9 and 3′6 These values, however, do not represent the ranges and average departure of the mean diurnal varia-

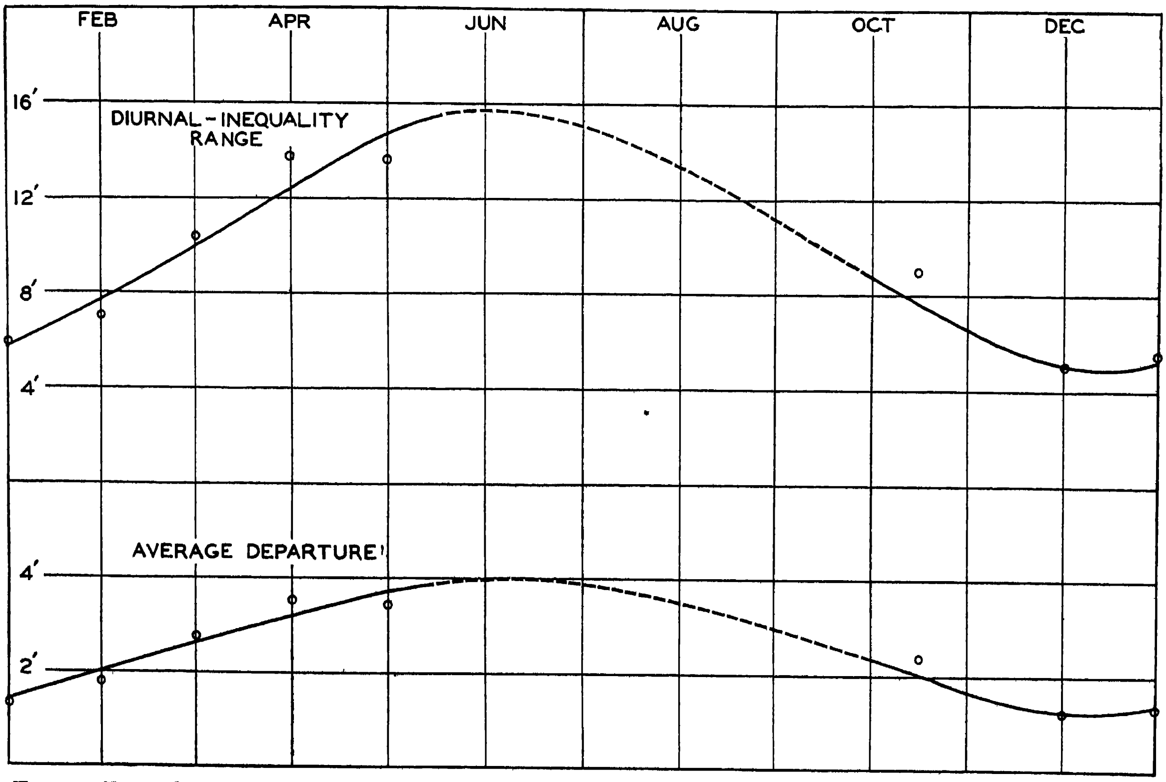


FIG 24—Diurnal-inequality range and average departure of magnetic declination at Four Pillar Island, all days, October 1924 to May 1925

tion of the periods, because these must be smaller than the means of the monthly ranges and average departures since the time of the occurrence of the extreme values changes from month to month. From the values in Table 33 it is thus found that the range and the average departure for the period October to May are 8′1 and 2′12, respectively, but the means of the monthly values are 9′1 and 2′34, respectively The latter quantities thus have to be reduced by about 10 per cent of their value in order to become equal to the corresponding quantities derived from the mean hourly values for the whole period Reducing the mean values which were derived from the curves of Figure 24 accordingly, we find the following approximate ranges and average departures

Season	Winter	Summer	Year
Range	6′8	12′5	9′6
Average departure	1 7	3 2	2 4

According to these figures, the ratio between summer and winter ranges at this station is 1.84 and between summer and winter average departures 1.88

(8) DIURNAL VARIATION ON DAYS OF DIFFERENT MAGNETIC CHARACTER

Table 34 has been prepared in order to examine the influence of the disturbances on the diurnal variation of the declination All complete days from December 1924 to May 1925 have been divided into three groups according to the magnetic character-number, and the mean hourly values of the declination have been computed within each group No subdivision of the entire period has been attempted Table 34 contains the hourly deviations from the means, and Figure 25 shows a graphical representation of the diurnal variation on quiet, moderately disturbed, and disturbed days In the figure the hourly

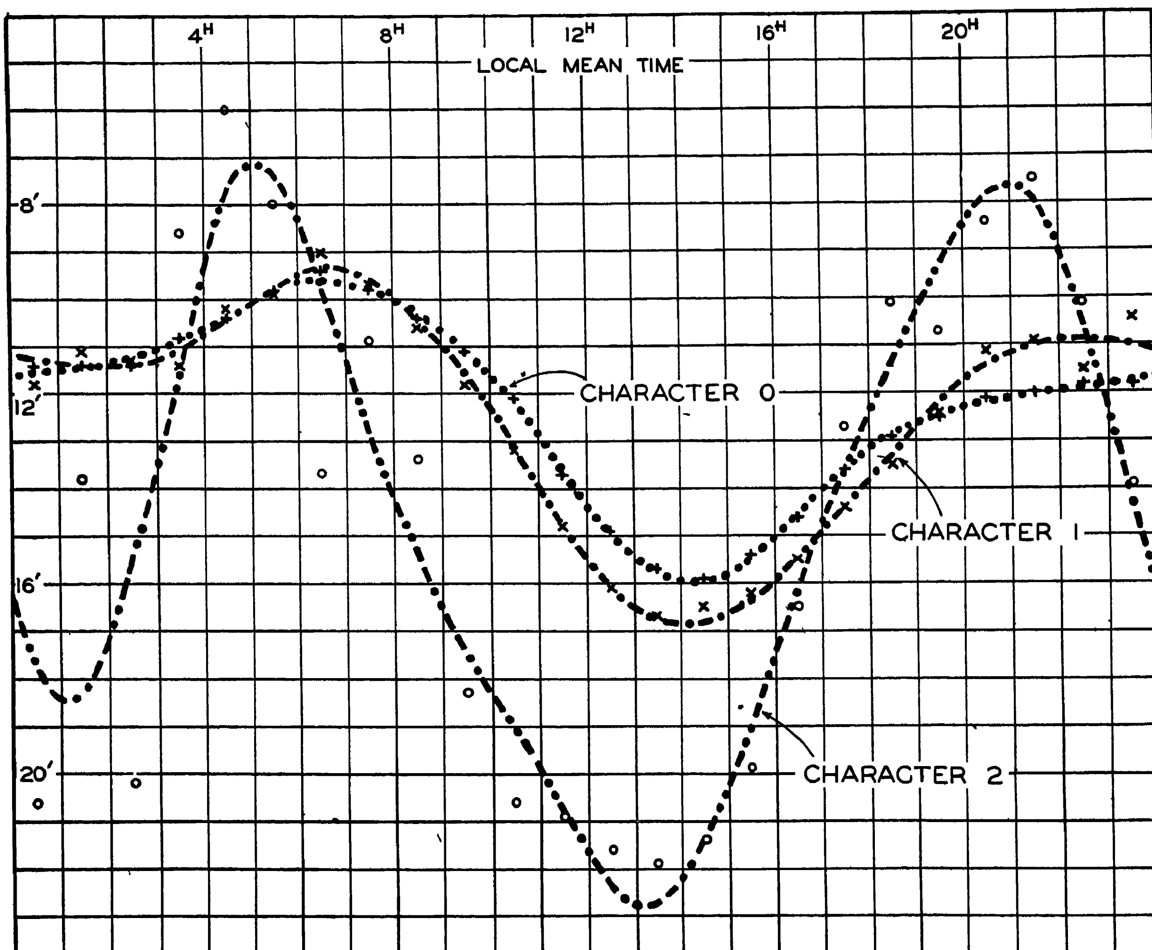


FIG 25—Diurnal variation of declination at Four Pillar Island, days of magnetic character-numbers 0, 1, and 2, December 1924 to May 1925

values of the declination have been entered instead of the deviations from mean, and curves are drawn, based on the results of harmonic analyses We find that the diurnal variation is practically the same on quiet and on moderately disturbed days The primary and secondary extremes occur at the same hours, but the range is slightly larger on the moderately disturbed days On the very disturbed days we find that the secondary maximum and minimum are so strongly developed that they become almost equal to the primary, and the range of the variation is very great compared to the range on quiet days. The morning maximum and afternoon minimum occur earlier than in the other groups The diurnal variation on the disturbed days, however, is derived from observations on 10 days only, but it can not be doubted that the strong development of the secondary maximum and minimum is a characteristic feature of the disturbed days.

TABLE 34—*Diurnal Inequality of Declination at Four Pillar Island on Days of Different Magnetic Character-Numbers (hourly departures*[a] *from mean)*

[The tabular values are average values for successive periods of one hour as indicated local mean time]

Magnetic character	0^h–1^h	1^h–2^h	2^h–3^h	3^h–4^h	4^h–5^h	5^h–6^h	6^h–7^h	7^h–8^h	8^h–9^h	9^h–10^h	10^h–11^h	11^h–12^h	12^h–13^h
	′	′	′	′	′	′	′	′	′	′	′	′	′
0	+0 9	+0 9	+0 9	+1 5	+1 9	+2 5	+2 8	+2 5	+1 9	+1 2	+0 2	−1 4	−2 6
1	+0 7	+1 4	+1 2	+1 1	+2 3	+2 6	+3 5	+2 8	+1 9	+0 7	−0 7	−2 3	−3 6
2	−6 0	+0 8	−5 6	+6 0	+8 6	+6 6	+0 9	+3 7	+1 2	−3 7	−6 0	−6 3	−7 0

Magnetic character	13^h–14^h	14^h–15^h	15^h–16^h	16^h–17^h	17^h–18^h	18^h–19^h	19^h–20^h	20^h–21^h	21^h–22^h	22^h–23^h	23^h–24^h	Range	Average departure
	′	′	′	′	′	′	′	′	′	′	′	′	′
0	−3 4	−3 6	−3 1	−2 3	−1 3	−0 6	−0 2	+0 2	+0 3	+0 5	+0 5	6 4	1 60
1	−4 2	−4 0	−3 7	−3 0	−1 9	−1 0	−0 1	+1 4	+1 6	+1 0	+2 1	7 7	2 03
2	−7 3	−6 8	−5 3	−1 9	+1 9	+4 5	+3 9	+6 2	+7 1	+4 5	+0 7	15 9	4 69

[a] Plus sign indicates departure to eastward and minus sign departure to westward from mean

(9) FOURIER CONSTANTS

The computation of the Fourier constants has been carried out to the fourth term of the formula

$$D=\overline{D}+\sum_{1}^{n} c_n \sin(nt+\alpha_n)$$

where the time, t, is reckoned from 0^h L M. T and where c_1 and α_1 represent amplitude and phase-angle of the 24-hour term, c_2 and α_2, of the 12-hour term, and so on

The computed amplitude and phase-angles are entered in Tables 35 and 36

TABLE 35—*Fourier Constants for Mean Monthly Values, L M T, at Four Pillar Island*

Month or period	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
1924	′	°	′	°	′	°	′	°
October–November	3 62	64 9	1 46	260 5	0 4	180	0 2	178
December	1 54	71 8	1 04	241 0	0 5	99	0 3	338
1925								
January	1 62	72 5	1 03	244 0	0 6	221	0 7	171
February	2 50	46 6	1 35	238 4	0 4	131	0 2	56
March	3 73	29 3	2 37	194 2	0 5	346	0 2	246
April	4 65	37 1	3 51	186 3	0 3	270	0 2	74
May	4 66	28 9	3 41	221 1	0 4	221	0 2	155
October to March	2 44	52 5	1 29	232 1	0 2	132	0 1	205
October to May	2 93	41 5	1 84	221 2	0 1	212	0 1	174
Year	3 5	42	2 2	215				

TABLE 36—*Fourier Constants for Complete Days, L M T, at Four Pillar Island*

Magnetic character-number	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	′	°	′	°	′	°	′	°
0	2 33	32 2	1 27	215 4	0 2	25	0 1	115
1	2 88	44 0	1 63	210 5	0 2	131	0 0	345
2	4 23	79 5	4 96	242 2	2 1	228	1 2	192

From Table 35 it is seen that the amplitudes and phase-angles of the first two terms vary more or less regularly from month to month The values indicate clearly that both amplitudes are subject to an annual variation with a minimum in December and a maximum probably in June and that both phase-angles, which vary more irregularly from month to month, reach a maximum in winter and a minimum in summer Following the procedure which was used when deriving an approximate value of the mean diurnal range for the year, the approximate values for the constants of the two first harmonic terms which are entered in the last column of the table have been computed These two terms will represent the diurnal variation for the mean of the year with sufficient accuracy, because the higher terms are very small for the longer periods, running irregularly from month to month The mean range for the year computed by means of these approximate harmonic constants is 9′2, and is thus in agreement with the range of 9′.6 which was derived by another method

Within the groups of days of different magnetic character we find (Table 36) for the first two terms that the amplitudes and phase-angles increase with increasing disturbance The constants for the higher terms run irregularly, but are large on the disturbed days This might be expected, since the disturbed days are represented by ten cases only Comparing the amplitudes of the first two terms with each other, we find that the quiet and moderately disturbed days differ very little, but that the amplitude of the second term is very large relatively to the first on the very disturbed days The ratios c_2/c_1 for days with character-number 0, 1, and 2 are equal to 0 54, 0 56, and 1.17, respectively

(10) ABSOLUTE DAILY RANGES AND DAILY MAXIMA AND MINIMA

The absolute daily range at Four Pillar Island is generally less than 30′, but during magnetic storms it usually was more than 1° and on one occasion, January 20, 1925, it reached 5° 27′ Table 37 gives for each month and for the whole year the number of days on which the range was between stated limits

TABLE 37—*Absolute Ranges for Number of Days, L M T, when Range was between Stated Limits at Four Pillar Island*

Month	0′–15′	15′–30′	30′–45′	45′–1°	1°–1°5	1°5–2°	Greater than 2°	Sum
1924								
December	12	7	2	1	1	0	1	24
1925								
January	14	5	5	1	3	2	1	31
February	8	7	5	4	0	2	0	26
March	1	8	7	1	0	1	1	19
April	0	7	3	2	3	3	2	20
May	2	5	1	0	1	0	0	9
December to May	37	39	23	9	8	8	5	129

From this table we find that the range is less than 30′ in 59 per cent of all cases, between 30′ and 1° in 25 per cent, and larger than 1° in 16 per cent

Table 38 contains the mean, the maximum, and the minimum absolute range in every month, the ratio between the mean absolute ranges for the month, and the mean diurnal ranges as listed in Table 30, and also the final sunspot-numbers for the months as published in the *Journal of Terrestrial Magnetism* [5]

The mean absolute-ranges indicate a maximum of disturbance in the equinoctial months, while the ratio between the mean absolute and the mean diurnal-range has a maximum in winter

[5] Vol 30 (1925), p 86, vol 32 (1927), p 86

TABLE 38—*Absolute Daily Ranges, L M T, at Four Pillar Island*

Year	1924	1925					Mean
Month	December	January	February	March	April	May	
Mean	24′9	41′5	31′0	43′0	59′3	25′2	37′5
Maximum	127 3	326 9	114 2	225 6	153 9	66 7	169 0
Minimum	3 7	5 1	6 5	13 5	18 9	13 5	10 2
Ratio	5 08	7 55	4 56	4 06	4 30	1 88	4 64
Sunspot-numbers	16 5	5 5	23 2	18 0	31 7	42 8	23 0

Tables 39 and 40 show the number of days in each month and for the whole period when the daily extremes lie within given time-intervals of 2 hours. The frequency of the occurrence of the extremes shows in both cases a double periodicity The frequent occurrence of the maximum between 6^h and 8^h and of the minimum between 14^h and 16^h corresponds to the normal diurnal variation, while the frequency of both extremes between 20^h and 4^h indicates that these hours are mostly disturbed An inspection of the records confirms this result.

TABLE 39—*Number of Days when the Maximum Declination Occurred between Stated Hours at Four Pillar Island*

Month	0^h–2^h	2^h–4^h	4^h–6^h	6^h–8^h	8^h–10^h	10^h–12^h	12^h–14^h	14^h–16^h	16^h–18^h	18^h–20^h	20^h–22^h	22^h–24^h
1924												
December	5	3	1	5	0	0	0	0	0	1	4	5
1925												
January	8	4	3	5	0	0	0	0	0	0	4	7
February	3	0	5	4	1	0	0	0	0	1	4	8
March	8	0	2	1	4	0	0	0	0	0	0	4
April	2	1	3	2	2	0	0	0	0	2	6	2
May	0	0	2	5	0	0	0	0	0	0	1	1
Sum	26	8	16	22	7	0	0	0	0	4	19	27

TABLE 40—*Number of Days when the Minimum Declination Occurred between Stated Hours at Four Pillar Island*

Month	0^h–2^h	2^h–4^h	4^h–6^h	6^h–8^h	8^h–10^h	10^h–12^h	12^h–14^h	14^h–16^h	16^h–18^h	18^h–20^h	20^h–22^h	22^h–24^h
1924												
December	6	1	1	0	0	4	6	1	0	0	2	3
1925												
January	6	8	0	1	1	1	2	2	2	0	3	5
February	8	3	3	0	2	1	2	4	1	0	1	1
March	6	3	0	0	0	0	0	7	0	1	0	2
April	2	4	1	0	0	1	2	6	0	1	1	2
May	1	0	0	0	0	0	2	4	1	0	1	0
Sum	29	19	5	1	3	7	14	24	4	2	8	13

RELATION BETWEEN THE OCCURRENCE OF AURORA BOREALIS AND MAGNETIC STORMS

During the drift we noted that the magnetic declination generally was changing rapidly during a display of aurora. Our records are, however, too scanty to allow an examination of the relationship between the two phenomena At Cape Chelyuskin the magnetic disturbances were recorded very frequently, but for this station we have no corresponding notes regarding the occurrence of aurora We kept no night-watchman and, therefore, made no observations during the night, but the writer made extensive

notes regarding the occurrence of aurora before 22^h and after 8^h. These notes were sent home by Tessem and Knudsen in 1919 and were lost (p 516) No copies exist and, therefore, no data are available by means of which the relation between aurora and magnetic disturbances at Cape Chelyuskin can be examined At Four Pillar Island, however, we have records of the magnetic declination and observations of the aurora for a period of 4 months, December 1924 to March 1925, and here we can make an investigation of this relation

During the three winters from 1922 to 1925 regular observations of aurora were taken by the night-watchmen, who were instructed at every even hour between 22^h and 6^h to note the intensity, form, and position in the sky of the auroral displays. Observations before 22^h and after 6^h were taken by Malmgren or the writer At Four Pillar Island the observations of aurora were carried out from the end of September 1924 to the beginning of April 1925, when the nights became too bright for further observations The observations do not permit a detailed investigation of the relations between the display of aurora borealis and the occurrence of magnetic disturbances, because the notes regarding the aurora are too general and contain no information about time of beginning and ending of displays, but a few compilations give an idea of the nature of the relation We may, at first, group the observed absolute-ranges of the declination according to the maximum intensity of the aurora observed on the same day The intensity-scale of 1 to 4 was arbitrary, the classes being defined as follows 1, weak, 2, moderate, 3, strong, 4, brilliant The last description was used in two cases only, which in the following tables are included under intensity 3 For the period December to April, 71 days are available on which the range of the declination and the aurora both were observed, including the cloudless days on which "No aurora" has been entered, but excluding all the overcast days Table 41 contains the number of days on which no aurora or aurora with intensity 1 to 3 was noted and on which the absolute diurnal range of the declination stayed between the limits stated in the heading of the table

TABLE 41—*Number of Days with Absolute Daily Range of Declination between Stated Limits when Aurora of Different Intensities was Noted during the Day, with Mean Ranges within Each Group and Number of Days of Magnetic Character-Number 0, 1, or 2, at Four Pillar Island*

Intensity of aurora	Absolute range				Magnetic character-number			Mean absolute range
	0′–15′	15′–30′	30′–1°	Greater than 1°	0	1	2	
No aurora	7	7	1	0	10	5	0	14′8
1	11	7	7	1	12	13	1	22 7
2	3	5	10	4	3	16	3	43 8
3	0	1	2	5	0	5	3	103 9

The table also contains the number of days of character-number 0, 1, or 2, and the mean absolute ranges corresponding to the various intensities of the aurora From the mean absolute ranges it is immediately seen that these increase with increasing intensity of the aurora From the other parts of the table the following conclusions can be drawn

(1) No severe magnetic disturbances occur in the absence of aurora, but small disturbances are common
(2) A weak aurora in more than half of all cases is accompanied by moderate magnetic disturbances
(3) A strong aurora is practically always accompanied by severe magnetic disturbances.

The first of these conclusions is the most uncertain, because the observations of the aurora were taken only at the even hours, and it is, therefore, quite possible that weak displays may have occurred on nights when no auroras were noted at the even hours.

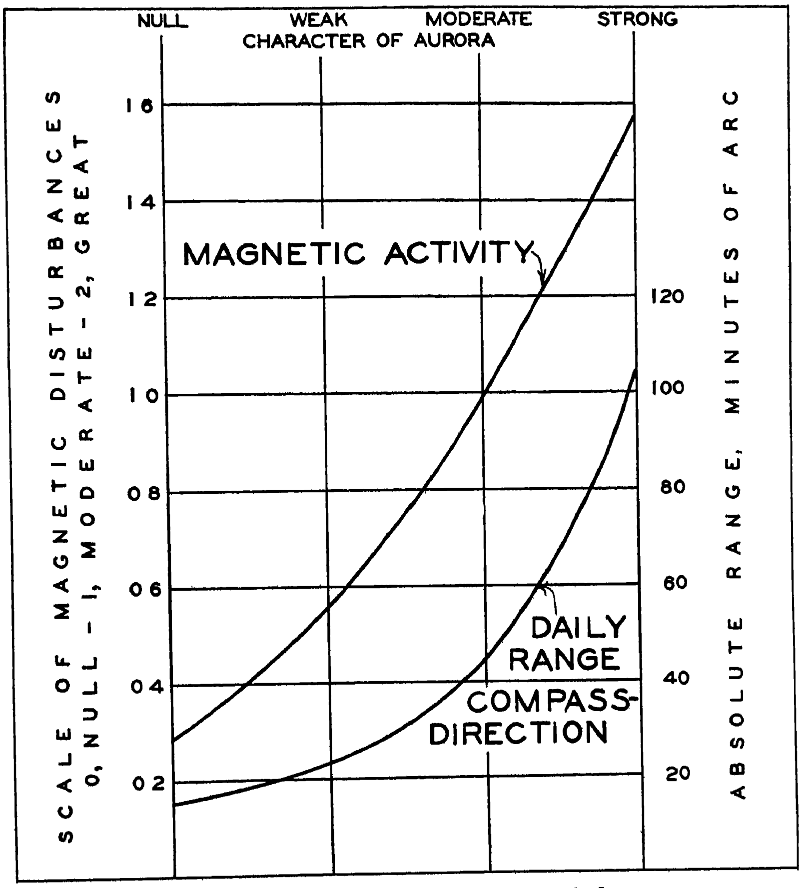


FIG 26—Magnetic correlation with auroral character

A closer inspection of the observations reveals that the altitude of the aurora above the horizon is a factor of importance. We may divide the days into three groups, according to the altitude of the aurora, then form the mean absolute ranges and count the number of days with character-number 0, 1, or 2 occurring within each group. The results are represented in Table 42.

TABLE 42—*Mean Absolute Ranges and Number of Days of Magnetic Character-Number 0, 1, or 2 when Aurora was Observed between Stated Altitudes at Four Pillar Island*

Intensity	Altitude of aurora			Magnetic character-number	Altitude of aurora		
	0°–15°	15°–30°	Greater than 30°		0°–15°	15°–30°	Greater than 30°
1	20′3	25′2	35′8	0	12	3	0
2	15 3	41 8	56 5	1	11	6	17
3			103 9	2	1	0	6

It is evident from Table 42 that the intensity of the magnetic disturbances increases with increasing altitude of the aurora The very low auroras are frequently not accom-

panied by any magnetic disturbances, but the high auroras are always accompanied by disturbances It is also evident that during the brilliant displays the aurora always spreads to greater altitudes above the horizon

These results are confirmed if the single cases are inspected In order to bring them out still more clearly, we can give a magnetic character-number to the hours from which observations of the aurora are available and correlate these character-numbers with the observed auroras as has been done by C Chree[6] and Wright[7] in their discussion of the relation between aurora and magnetic character-number at Cape Evans

For the period December 1, 1924, to April 6, 1925, there are 430 hours from which both records of the declination and observations of aurora are available The observations of aurora were generally made at every even hour, but the entries in the notebooks on clear nights are frequently condensed, as, for instance, "0^h to 6^h, no aurora " In these cases the observation "No aurora" has been entered on every second hour only when comparing the notes with the records of the declination, viz, 0^h, 2^h, 4^h, and 6^h, because the cloudiness was noted at these hours and, therefore, it is certain that no aurora was observed at these hours, but it is not absolutely certain that the auroral observation was taken at the odd hours between them The hours at which auroral observations had been taken were entered on forms, and the magnetic character 0, 0 5, 1, 1 5, or 2 for these hours was estimated from the record and entered before the result of the auroral observation was carried over to the form, in order to prevent prejudice when estimating the magnetic character If no aurora was observed, this was noted as 0 If aurora was observed, the intensity, the altitude above the horizon, and the type of the aurora, whether quiet or moving, were entered Arches and diffuse or cloud-like auroras were regarded as quiet forms, while curtains, rays, and coronas were regarded as moving types A few cases had to be omitted because information about altitude or type was lacking

TABLE 43—*Number of Hours of Stated Magnetic Character at Four Pillar Island when No Aurora, Aurora of Different Intensity, Altitude of Aurora, and Type of Aurora were Noted, with Mean Magnetic Character-Number of Each Group*

Aurora	Hours with magnetic character-number					Mean magnetic character-number
	0	0 5	1	1 5	2	
No aurora	131	89	17	4	0	0 28
Aurora of intensity						
1	43	50	32	5	5	0 55
2	1	15	14	9	3	0 98
3	0	1	3	4	4	1 56
Aurora at altitude above horizon						
Smaller than 15°	41	46	22	3	0	0 44
15°–30°	3	12	8	1	3	0 80
Greater than 30°	0	8	19	14	9	1 24
Type of aurora						
Quiet	43	52	31	5	6	0 56
Moving	1	14	18	13	6	1 08

Table 43 has been derived from this compilation of the observations The table contains the number of hours with character-number stated in the heading corresponding to observations of no aurora, of auroras of different intensities, of different altitudes, and of different forms The mean magnetic character-numbers are found in the last column of the table From this column it is directly seen that the mean magnetic character of the hour stands in close relation to the aurora It is very small with absence of aurora, and in the presence of aurora it increases with intensity, altitude, and movement of the aurora.

[6] British Antarctic Expedition, 1910–1913 Terrestrial Magnetism, chapter XIV, p 403

[7] *Ibid* Observations of the Aurora, pp 32–41

The magnetic character of the hour is smaller than 1 in 220 of the 241 hours at which no aurora was noted. Regarding the 21 hours for which the character-number is 1 or 1 5 with absence of aurora, we find, when looking through the records, that in 14 cases, including the four when the character-number was 1 5, auroras were observed on the same nights, but at different hours. Considering that the auroral observations were taken once an hour only, it seems probable that aurora might have occurred even on the nights containing the remaining seven cases (See also Fig 27) We therefore find that

(1) A magnetic disturbance of character 1 or larger occurred seldom if aurora was not present at the same time

(2) A magnetic disturbance of character 1 occurred very seldom if no aurora was observed during the night, and a greater disturbance never occurred

This is simply a statement of the conditions which we have observed, and not a general conclusion.

Turning to the hours when aurora was observed, we find that frequently the weak auroras were not accompanied by any magnetic disturbances and seldom by violent ones, while the brilliant displays were accompanied always by disturbances which were often violent The same laws hold for low and high or for the quiet and moving auroras. Grouping the auroras of different intensities and different types according to altitude, we find the values in Table 44

TABLE 44—*Number of Hours of Stated Magnetic Character-Number at Four Pillar Island on which Auroras of Different Intensity or Type were Noted at Different Altitudes above Horizon, with Mean Magnetic Character-Numbers*

Aurora		Hours with magnetic character-number					Mean magnetic character-number
Intensity or type	Altitude	0	0 5	1	1 5	2	
1	Smaller than 15°	40	38	18	3	0	0 42
	15°–30°	3	8	4	1	1	0 42
	Greater than 30°	0	4	10	1	4	1 13
2	Smaller than 15°	1	8	4	0	0	0 62
	15°–30°	0	3	3	0	2	1 06
	Greater than 30°	0	4	7	9	1	1 17
3	Smaller than 15°	0	0	0	0	0	
	15°–30°	0	1	1	0	0	0 75
	Greater than 30°	0	0	2	4	4	1 60
Quiet	Smaller than 15°	39	38	18	3	0	0 42
	15°–30°	4	7	6	0	2	0 71
	Greater than 30°	0	7	7	2	4	1 08
Moving	Smaller than 15°	1	7	4	0	0	0 62
	15°–30°	0	5	1	1	1	0 88
	Greater than 30°	0	2	13	12	5	1 31

The figures in Table 44 bring out the fact that the altitude of the aurora is of greater importance than the intensity or the type, because the differences between auroras of the same intensity or type in different altitudes is greater than the difference between auroras at the same altitude but of different intensity or type We therefore find that

(1) A low aurora is frequently not accompanied by any magnetic disturbance at the same hour and never by a violent disturbance

(2) A high aurora is always accompanied by a simultaneous magnetic disturbance and frequently by a very violent one

(3) The intense and rapidly moving auroras are accompanied by greater magnetic disturbances than weak and quiet auroras occurring at the same altitude above the horizon

The relationship between the displays of aurora and the magnetic disturbances which the present investigations show at Four Pillar Island is much closer than the rela-

tionship which C Chree and C S Wright found at Cape Evans, on the Antarctic Continent Wright finds there no relation between the altitude of the aurora and the magnetic character at the hour of observation and only a slight relation between the brilliancy of the aurora and the magnetic disturbance. In this connection, it is interesting to note that at Cape Evans the middle of the day is mostly disturbed magnetically, but that the frequency of the aurora shows a maximum in the night hours At Four Pillar Island, however, both the maximum of magnetic disturbance and the greatest frequency of aurora occur around midnight

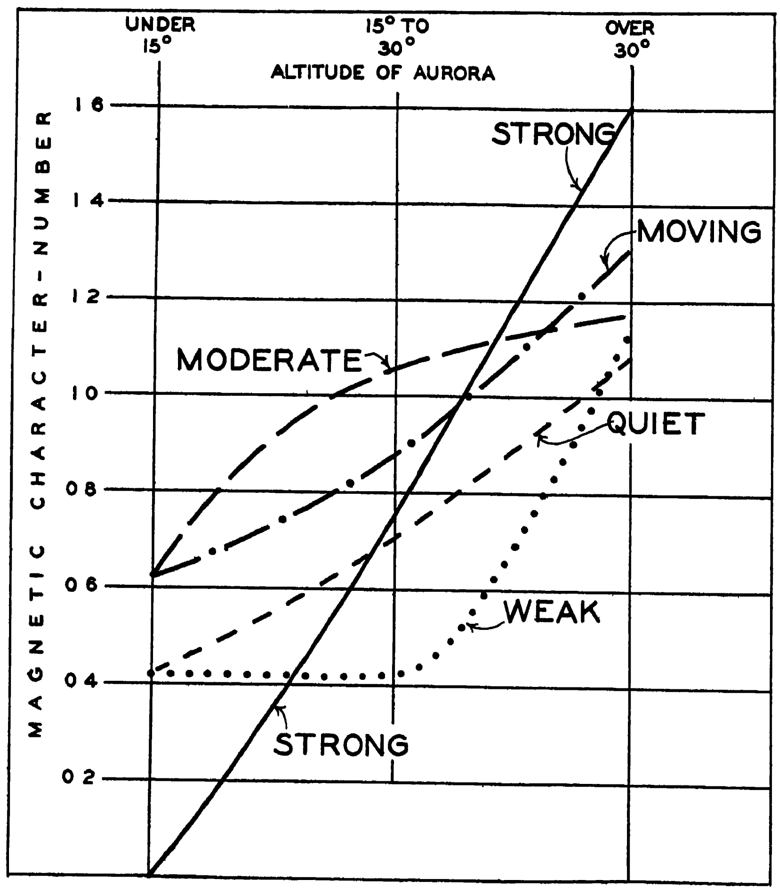


FIG 27—Auroras and magnetic disturbances

The significance of the results regarding the relation between magnetic disturbances and aurora at Four Pillar Island becomes clearer when the situation of the station relative to the zone of maximum intensity is taken into account The station was located about 6° of latitude south of the zone of maximum frequency of the aurora During the drift, the *Maud* was very close to this zone and the aurora was then very frequently observed near the zenith, an arch extending from horizon to horizon and passing above our heads was a common form At Four Pillar Island the most frequent form of aurora was, on the other hand, a low arch only 5° to 20° above the northern horizon, probably corresponding to a quiet and narrow display of aurora in the zone where the aurora generally occurs in the zenith We have no observations which directly show that a display of this form was accompanied by magnetic disturbances directly underneath it, but the very great frequency of magnetic disturbances recorded at Cape Chelyuskin, which was practically within the zone of maximum frequency of aurora, indicates that there the aurora practically always is accompanied by magnetic disturbances

However this may be, our observations at Four Pillar Island show that these displays of aurora are only occasionally accompanied by magnetic disturbances, which are recorded in a region in which the display is seen as a low arch a few degrees above the horizon If, however, the display becomes more vivid, broadens out, or is displaced to the south in such a way that it appears high in the sky at the southern station, then it is accompanied by magnetic disturbances at this station

COMPARISON OF DIURNAL VARIATION OF DECLINATION AT NEIGHBORING STATIONS

It will be of interest to compare the diurnal variation at the two stations, Cape Chelyuskin and Four Pillar Island, with the corresponding variation at neighboring stations. Previous to 1918 this variation had been determined for a complete year at only one station in the region visited by the *Maud*, namely, at the Russian polar station, Ssagastyr, at the Lena Delta, which was occupied from November 1882 to June 1884 [8] A short series covering the months of January, February, and March 1879 is available from Pitlekai, where A E Nordenskiold's vessel, the *Vega*, wintered during the first circumnavigation of Asia.[9] The nearest stations outside of the region from which observations for about one year are available are Teplitz Bay in Franz Josef Land, which was occupied by the Ziegler Polar Expedition from October 1903 to June 1904,[10] and the United States polar station Ooglaamie, near Point Barrow, which was occupied from September 1882 to August 1883 [11] Table 45 shows the geographic positions of these stations, the mean inclination, and the magnetic latitude, ψ, computed by means of the equation

$$\tan =\psi\frac{1}{2}\tan I$$

where I is the inclination The table, furthermore, contains the diurnal-inequality range (difference between maximum and minimum hourly values) deduced from the mean diurnal variation of declination for a year, except for Pitlekai, where the range, which is derived from the observations in January, February, and March only, is placed in parentheses, and finally the sunspot-numbers are given These latter numbers are only approximate and are placed in parentheses at all stations where the observations extended over less than one year The stations have been arranged according to decreasing magnetic latitude As the diurnal-inequality range, d, is known to vary considerably during a sunspot-cycle, an attempt has been made to give in the last column of the table the values, d_0, reduced approximately to sunspot-number zero by means of the following relation,[12] in which S is the Wolf-Wolfer relative sunspot-number

$$d=d_0\,(1+0\ 7\ S)$$

From Table 45 it is seen that the diurnal-inequality range does not decrease regularly with the magnetic latitude, as regards Ssagastyr, Four Pillar Island, and Pitlekai The magnetic latitudes of Teplitz Bay and Ssagastyr are nearly the same, but the range at Ssagastyr is about half the range at Teplitz Bay

In order to compare the character of the diurnal variation of the declination, the first four Fourier constants representing the variation have been compiled in Table 46,

[8] A v TILLO Beobachtungen der russischen Polarstation an der Lenamündung I Theil Astronomische und magnetische Beobachtungen 1882–1884 bearbeitet von V Fuss, F Mueller, und N Jürgens 1895

[9] A E NORDENSKIÖLD Vega-expeditionens vetenskapliga iakttagelser Vol II, pp 429–504, Observations magnétiques faites pendant l'expédition de la Vega 1878–80, par A Wijkander

[10] W J PETERS and JOHN A FLEMING The Ziegler Polar Expedition, 1903–1905, Scientific Results Washington, D C, 1907.

[11] C A SCHOTT Discussion of magnetic observations at the United States polar station at Ooglaamie, Alaska Report of Superintendent of U S Coast and Geodetic Survey, 1883, Appendix No 13, p 347, Washington, D C, 1884

[12] The coefficient of S, namely 0 7, while it applies strictly to the diurnal inequality, for all days, 1890–1900, at Pavlovsk, Russia, appears to be fairly representative for a large region of the globe (see Encycl Brit, 11th Ed, Vol XVII, Table XXVII, p 372)

where the stations again have been arranged according to magnetic latitude The harmonic constants for the year at Teplitz Bay are published by W J Peters and John A Fleming, but the constants for the two half years have been computed from the published hourly values The computations of the constants for Ssagastyr, Ooglaamie, and Pitlekai have also been made from the published hourly values

TABLE 45—*Magnetic Stations in High Latitudes from Franz Josef Land to Point Barrow, Alaska*

Station	Period	Lat north	Long east	Incl'n north	Mag'c lat	Diur-meq range	Sun-spot-number	d_0
		° ′	° ′	° ′	° ′	′		′
Cape Chelyuskin	Oct 1918–Aug 1919	77 33	105 40	85 32	81 07	95	(75)	62
Teplitz Bay	Oct 1903–Jun 1904	81 47	57 59	83 12	76 35	50	(38)	39
Ssagastyr	Jan 1883–Dec 1883	73 23	126 36	83 09	76 29	26	64	18
Ooglaamie	Sep 1882–Aug 1883	71 18	203 20	81 24	73 10	40	60	28
Four Pillar Island	Oct 1924–May 1925	70 43	162 25	79 08	69 00	9 5	(23)	8 2
Pitlekai	Jan 1879–Mar 1879	67 06	186 29	77 01	65 15	(6 6)	(0 5)	(6 6)

The diurnal variation at these stations for the mean of the year, excluding Pitlekai, has been represented graphically in Figure 28, where the curves are computed by means of the Fourier constants given in Table 46 In making a comparison between these curves, not only the varying magnetic latitude should be kept in mind, but also the fact that the curves apply to different sunspot-conditions (see Table 45)

TABLE 46—*Fourier Constants at Six Arctic Stations*

Season	Station	c_1	a_1	c_2	a_2	c_3	a_3	c_4	a_4
		′	°	′	°	′	°	′	°
Winter	Cape Cheluyskin	29 3	6 4	17 0	291 2	3 0	198	3 2	71
	Teplitz Bay	15 35	15 1	6 87	309 2	1 0	137	1 0	60
	Ssagastyr	5 14	2 4	5 84	284 6	2 0	252	0 5	265
	Ooglaamie	13 61	343 4	8 62	245 7	1 6	142	2 0	268
	Four Pillar Island	2 44	52 5	1 29	232 1	0 2	132	0 1	205
	(Pitlekai)	(1 18)	(312 6)	(0 91)	(210 2)	(0 4)	(342)	(1 2)	(264)
Summer	Cape Cheluyskin	48 7	348 2	17 1	278 7	5 6	209	3 6	88
	Teplitz Bay	28 26	354 8	6 95	303 8	2 8	193	2 4	100
	Ssagastyr	11 37	351 4	6 82	261 1	1 2	260	0 4	338
	Ooglaamie	17 09	338 3	9 54	232 5	2 7	130	2 4	323
Year	Cape Chelyuskin	38 6	355 4	17 1	284 8	4 3	205	3 6	82
	Teplitz Bay	21 11	1 8	6 90	306 4	1 8	179	1 6	89
	Ssagastyr	8 21	355 0	6 23	271 5	1 7	259	0 4	309
	Ooglaamie	15 15	341 0	9 05	238 6	2 2	136	2 0	302
	(Four Pillar Island)	(3 5)	(42 0)	(2 2)	(215)				

Comparing the winter and summer values, we find that the amplitude of the 24-hour terms at all stations is larger in summer than in winter, while the phase-angle is smaller The amplitude of the 12-hour wave at Cape Chelyuskin and at Teplitz Bay remains almost constant from winter to summer, but increases slightly at Ssagastyr and Ooglaamie The phase-angle for the 12-hour wave at all stations is less in winter than in summer The variations of the higher terms are more irregular, but we find that both amplitudes and phase-angles generally increase from winter to summer The ratio between the amplitudes of the 12-hour and 24-hour terms varies from station to station, but with remarkable regularity if the stations are arranged according to geographic longitude From the mean values for the year we find that the ratio c_2/c_1 for Teplitz Bay, Cape Chelyuskin, Ssagastyr, Four Pillar Island, and Ooglaamie, are respectively 0 33, 0 44, 0.76, 0 63, and 0 60 According to this, the ratio shows a maximum in the vicinity of Ssagastyr.

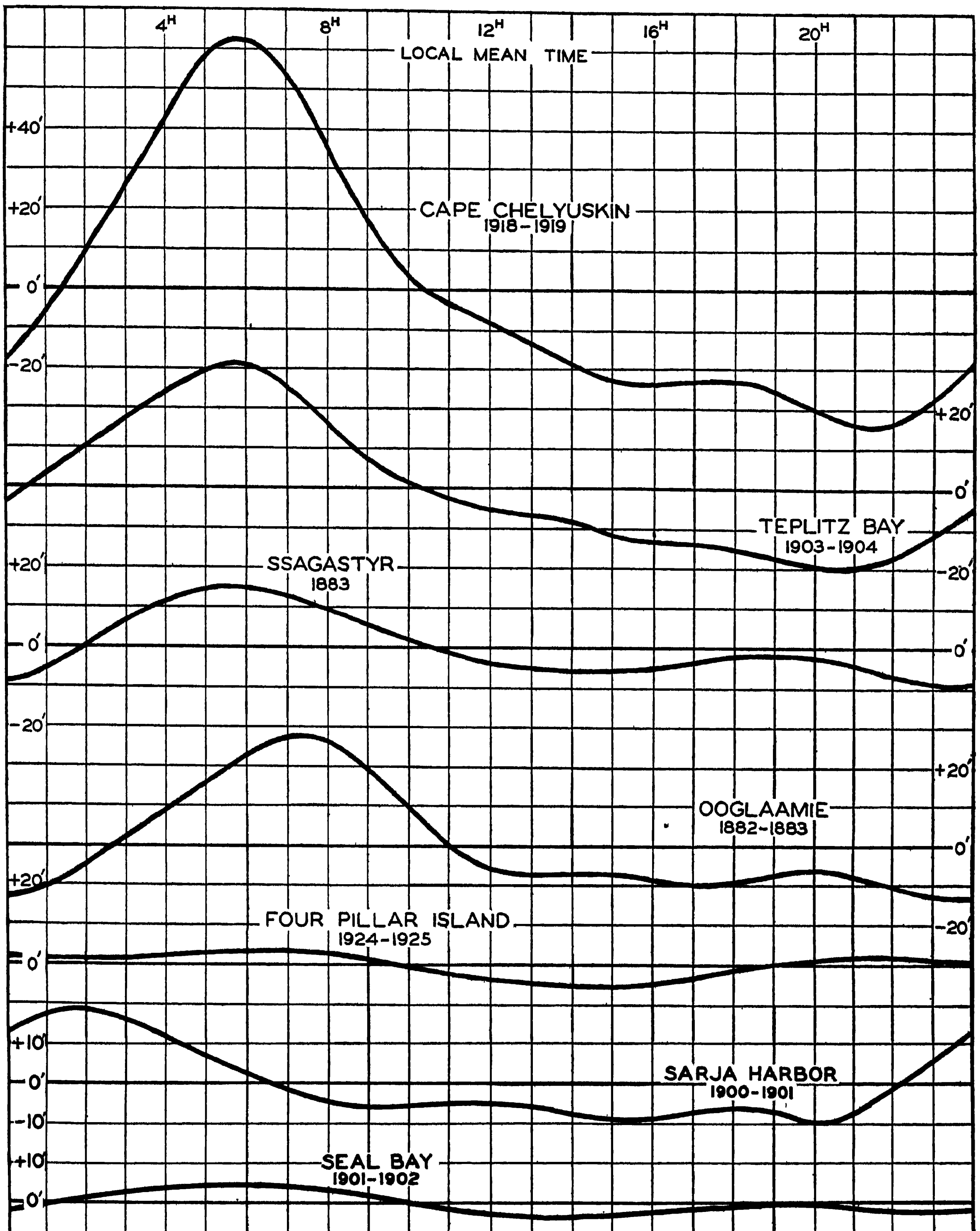


FIG 28—Diurnal variation of magnetic declination at some Arctic stations

Summing up, we find a good agreement between the main features of the diurnal variation at these stations as well as a regularity in the differences. The most outstanding discrepancies are the large phase-angle of the 24-hour term at Four Pillar Island and the small ranges at Four Pillar Island and Ssagastyr.

It is of interest to examine more closely the relation between the diurnal-inequality range of the declination at these stations and the magnetic latitude. This relation, according to L. A. Bauer,[13] can be expressed approximately by the equation $d=k \sec^2 \psi$, where d is the range of the mean diurnal-variation for the year, ψ the magnetic latitude, and k a coefficient varying with sunspottedness. Using the diurnal-inequality data for these stations compiled by W. J. Peters and J. A. Fleming[14] and the final, corrected sunspot-numbers, and then reducing all values of d to zero sunspot-number by means of the approximate relation on page 419, the following preliminary expression is obtained by the method of least squares.

$$d_0=1.80 \sec^2 \psi \text{ (sunspot-number 0)}$$

E. V. Krakau[15] has recently made the relation between the diurnal range of the declination and the magnetic latitude subject to an extensive investigation and finds the relation:

$$d=(4'92+0'.024\, r)\,(0.6+\tan \psi)$$

Where r is the sunspot-number and where d at polar stations represents the mean diurnal range on *quiet* days. We can apply the formula of Bauer to the five stations for which we have approximate values of the mean range (the first five stations of Table 45), but applying the formula by Krakau, we can use only the observations from Cape Chelyuskin and Four Pillar Island. The diurnal-inequality range on quiet days at Cape Chelyuskin is 56′ according to Table 20, and at Four Pillar Island it is approximately 9′. Data for the quiet days are not available for Teplitz Bay, Ssagastyr, and Ooglaamie. We find the following values as given in Table 47.

TABLE 47—*Observed and Computed Diurnal-Inequality Ranges of Declination*

Station	Range (All days)			Range (Quiet days)		
	Observed	Computed (Bauer)	Observed minus computed	Observed	Computed (Krakau)	Observed minus computed
	′	′	′	′	′	′
Cape Chelyuskin	95	114	−19	56	47	+9
Teplitz Bay	50	43	+7			
Ssagastyr	26	48	−22			
Ooglaamie	40	30	+10			
Four Pillar Island	9.5	16	−7.5	9	17	−8

The number of stations is far too small to allow any comparison between the two formulas, and such comparison is not intended by the writer, especially as the formulas depend on different data and magnetic conditions. The intention of this and the preceding discussion is to show that the diurnal variation at Cape Chelyuskin is of the usual character, because the range corresponds to what might be expected from the magnetic latitude, and the phase-angles of the various terms agree with the phase-

[13] *Terr. Mag.*, vol. 2, p. 70, 1897.

[14] See footnote 10. The following final sunspot-numbers should be substituted for the published preliminary ones: Teplitz Bay, 38.5 instead of 80, De Bilt, 24 instead of 60, Zikawei and Colaba, each 3 instead of 10, Buitenzorg, 42 instead of 80. Owing to these changes, the values of k, given on p. 302 of the publication cited, no longer apply to the tabulated mean sunspot-numbers.

[15] E. V. KRAKAU. Etudes sur l'amplitude de la variation diurne de la declinaison magnétique en connexion avec la latitude magnétique locale. *J. Geophys. Met.*, Leningrad, vol. II (1925), pp. 89–120.

angles at neighboring stations The diurnal variation at Four Pillar Island is, however, of an unusual character, because the range is much smaller than expected from the magnetic latitude, and the phase-angle of the 24-hour term deviates much from the corresponding phase-angles at neighboring stations. This result is substantiated by the fact that the ranges at the two stations (Ssagastyr and Pitlekai), which are nearest to Four Pillar Island, are unusually small. The general conclusion to be drawn from the preceding discussion is, therefore, that in northeastern Siberia we find a region where the range of the diurnal variation of the declination is very small.

Hourly observations of the magnetic declination were also taken at two stations in the region with which we have been dealing by E. v. Toll's Russian Polar Expedition of 1900 to 1903, namely, at Sarja Harbor, southwest of Cape Chelyuskin, and at Seal Bay, halfway between Cape Chelyuskin and Four Pillar Island. These observations, which were published in 1926 by the Commission for the Exploration of the Republic Yakutsk, were not received before the above discussion had been completed,[16] but must be briefly mentioned here, because they add interesting information and confirm the conclusions in the preceding section. The hourly values at both stations were determined by eye-readings. Table 48 gives the periods of occupation of the stations, their geographical positions, the magnetic latitudes, and the mean observed values and ranges of the declination The latter were derived from the mean diurnal variation for the whole periods, which was computed from the published values

TABLE 48—*Stations of E v Toll's Russian North Polar Expedition, 1900 to 1903, giving Hourly Observations of the Magnetic Declination*

Station	Occupied	Number of days	Lat north	Long east	Inclination north	Magnetic latitude	Declination: Mean value	Declination: Mean range	Sunspot-number
			° ′	° ′	° ′	° ′	° ′	′	
Sarja Harbor	Dec 1900 to Apr 1901	136	76 08	95 04	84 02	78 12	29 29 9	27	1 5
Seal Bay	Nov 1901 to Apr 1902	171	75 22	137 10	83 54	77 56	3 51 1	8 6	3 6

The diurnal variation at these two stations is represented graphically in Figure 28, for which the curves have been computed by the Fourier constants compiled in Table 49. Comparing the curves in Figure 28 with the curves for the diurnal variation of the declination at the previously discussed stations, we find that the diurnal variation at Sarja Harbor deviates greatly from the variation at the two nearest stations, Teplitz Bay and Cape Chelyuskin, the chief maximum occurring about four hours earlier than at these stations This is expressed in the Fourier analyses by the difference of the phase-angles of the various terms from the corresponding values at the neighboring stations At Sarja Harbor we evidently meet a new type of the diurnal variation, but this station lies in a region from which no previous observations are available and for which no conclusions regarding the character of the diurnal variation have been drawn.

TABLE 49—*Phase-Angles and Amplitudes for E v Toll's Stations of North Polar Expedition of 1900 to 1903*

Station	Period	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
		′	°	′	°	′	°	′	°
Sarja Harbor	Dec 1900 to Apr 1901	10 9	52 0	5 6	34 5	2 2	8	1 0	66
Seal Bay	Nov 1901 to Apr 1902	2 9	17 9	2 2	254 8	0 4	280	0 4	312

[16] Travaux de la commission pour l'étude de la république autonome soviétique socialiste Yakoute, Tome II E W STELLING, D A. SMIRNOV, N V. ROSÉ Recueil d'observations magnétiques, faites en Yakoutie Leningrad, 1926

The station Seal Bay, on the other hand, lies almost exactly halfway between Cape Chelyuskin and Four Pillar Island and to the northeast of Ssagastyr. At this station the diurnal variation is of the same type as known from Ssagastyr and Four Pillar Island, the phase-angles of the two large terms have values between those found at these stations, and the amplitudes are, considering the magnetic latitudes, still smaller. The ratio between the amplitudes of the first two Fourier terms, $c_2/c_1 = 0.76$, has exactly the same value at Seal Bay as at Ssagastyr, where previously a maximum of this ratio was found. The values of the amplitudes at Seal Bay confirm strongly the conclusion that in northeastern Siberia there is a region where the range of the diurnal variation of the declination is very small.

PART IV—OBSERVATIONS OF THE ATMOSPHERIC ELECTRIC POTENTIAL-GRADIENT, 1922–1925

BY H U. SVERDRUP

INSTRUMENTS AND METHODS

(1) GENERAL REMARKS

When discussing the plans for the atmospheric-electric work of the *Maud* Expedition at the Department of Terrestrial Magnetism in 1922, it was decided to confine this work to observations of the potential gradient on account of the extensive scientific program and the limited personnel of the Expedition The time before the departure was too short for the construction of a suitable recording instrument and, accordingly, the Expedition was equipped with instruments for eye-readings only This circumstance made the observations rather strenuous, because observations of the diurnal variation of the potential gradient were the most important and these had to be obtained by eye-readings through 24 hours After the first winter we found that a recording instrument would be so desirable that we constructed a recording electrometer on board the ship This electrometer will be described later

The instruments which were supplied by the Department of Terrestrial Magnetism consisted of two electrometers, Wulf bifilar quartz-fiber electrometer 3537 and Gunther and Tegetmeyer leaf-electrometer 1443, two 100-cell chloride-of-silver batteries, four ionium collectors, two collector-posts with protected insulators, two wall-insulators with protective caps on both ends, and various accessories, including an ample supply of drying material When constructing the protective caps of the collector-posts and the wall-insulators advantage was taken of the experience from the Antarctic, which Dr G C Simpson[1] has described in his discussion of the observations of the potential gradient at McMurdo Sound For further information reference may be made to the figures which are published in Dr. Simpson's report

(2) CALIBRATIONS OF ELECTROMETERS AND TEMPERATURE-EFFECT

The two electrometers were calibrated before the departure of the Expedition and on numerous occasions on board the *Maud*. The latter were made in the laboratory, using a voltmeter for determining the potential, which was applied to the fibers or leaf, and during the winter of 1922 to 1923 also on deck without voltmeter, because the chloride-of-silver batteries which were used could not deliver any current at the low temperatures The temperature-coefficient during the last named calibrations was applied to the potential of the chloride-of-silver batteries All calibrations of quartz-fiber electrometer 3537 were in perfect agreement with each other, and no temperature-effect could be discovered The electrometer remained absolutely unchanged until the middle of May 1925, when the observations were to be concluded Then the shellac, fastening the quartz bow to which the lower ends of the quartz fibers are attached, loosened The bow was brought back to approximately the old place, but the readings of the electrometer were changed considerably

During the winter 1922 to 1923, when used for field observations, the leaf-electrometer 1443 was calibrated, together with electrometer 3537. The first, in contrast to 3537, showed a marked temperature-effect, the sensitivity being smaller with low temperatures The potential corresponding to a given reading of the electrometer at $-26°$ C was about 6 per cent higher than the potential corresponding to the same reading at $+15°$ C This temperature-effect was taken into account when converting the readings to potentials.

[1] British Antarctic Expedition 1910–1913 Meteorology, vol I, Discussion, p 302

(3) METHODS OF OBSERVING DURING THE WINTER 1922 TO 1923

The ordinary observations of the atmospheric-electric potential in the winter of 1922 to 1923 were taken in the ice-house, which was built in October 1922. A collector-post bearing the collector at an altitude of 180 centimeters above the surface was frozen fast in the ice at a distance of 3.7 meters from the wall of the house. When drift-snow accumulated around the house, the collector was shifted higher up, thus keeping constant the distance from the surface to collector. A wall-insulator which was protected by a wooden tube was built in the wall when the house was constructed. The electrometer could be attached directly to the inner protecting cap of the wall-insulator, while the auxiliary batteries, watch, and recording forms could be placed on a small table. The electrometer and the batteries were never left in the ice-house, but after each observations were carried back to the ship, because the ice might break at any time and instrument left on the ice might be damaged or lost.

G. Olonkin, chief engineer, received instructions in taking the potential-gradient observations and took all the daily observations. During the 24-hour series he was assisted by F. Malmgren, assistant scientist, and by the writer. Malmgren during this winter also made the field observations for determination of the reduction-factor.

At the beginning of October 1922 the following program was decided upon. Observation of the potential gradient, 20 readings in 20 minutes, were to be taken regularly once a day at approximately the same Greenwich hour. Simultaneous observations with electrometer 3537 in the ice house and with electrometer 1443 at a field station for determination of the reduction-factor were to be taken in sufficient number. Observations throughout 24 hours for diurnal variation, consisting of readings during 20-minute periods, centered on the Greenwich hours, were to be taken, if possible, once a week. The last part of the program could not be carried out to the desired extent, mainly on account of the weather conditions. The potential would become disturbed as soon as the wind was strong enough to cause a slight drift of the snow along the surface and would always increase to values far beyond our range of measuring when the drift became dense. Consequently, weeks passed in which no 24-hour series could be attempted and on several occasions a series had to be discontinued on account of increasing wind and drift. At the end of May the increasing amount of fog made the observations very difficult, because a satisfactory insulation could not be maintained for any length of time. The dampness of the air became still greater in June, July, August, and September, frustrating all attempts to make atmospheric-electric observations during this period.

A number of successful 24-hour runs were obtained from October 1922 to April 1923, showing a diurnal variation which, referred to Greenwich time, was in perfect agreement with the variation found over all the oceans, according to the observations taken during the cruises of the *Carnegie*, thus confirming the conclusion that this variation follows universal time.[2] We found that it would be very desirable to confirm this result by a large number of series, but we could not increase the number of 24-hour eye-readings without straining the observers beyond reasonable limits. We would need a recording instrument, and the writer, therefore, asked our aviator, O. Dahl, whose skill as an instrument-designer and maker was invaluable to the Expedition, to construct a recording quadrant-electrometer.

(4) RECORDING QUADRANT-ELECTROMETER

All details of the complete instrument are shown in Figure 29, which was prepared by Dahl in November 1923. The main part is an ordinary quadrant-electrometer with a

[2] S. J. MAUCHLY. Note on the diurnal variation of the atmospheric-electric potential-gradient, *Phys. Rev.*, N. S., vol. 18 (1921), pp. 161–162 and 477, also, Recent results derived from diurnal-variation observations of the atmospheric-electric potential-gradient on board the *Carnegie*, *Bull. National Research Council* No. 17 (1922), pp. 73–77.

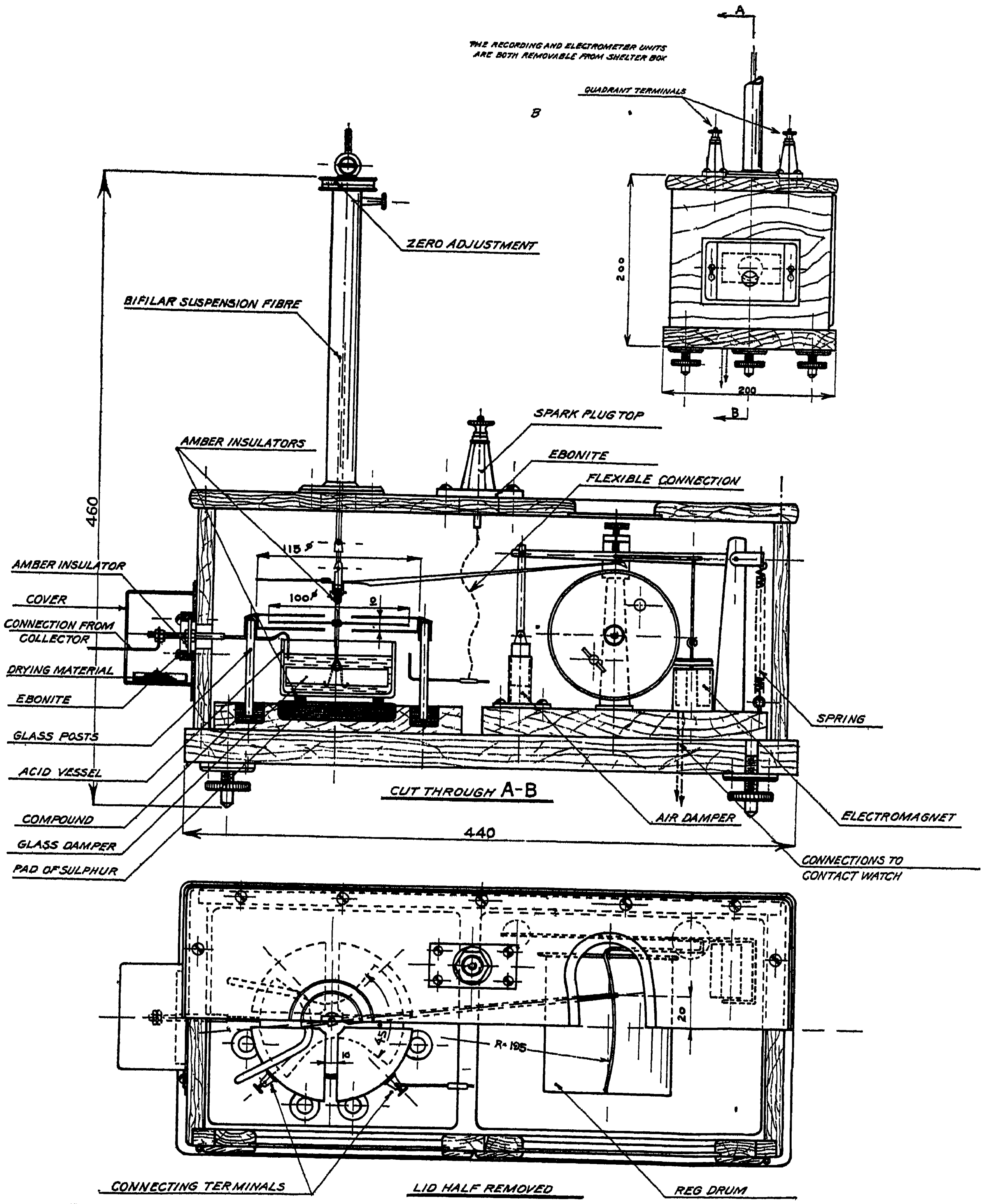


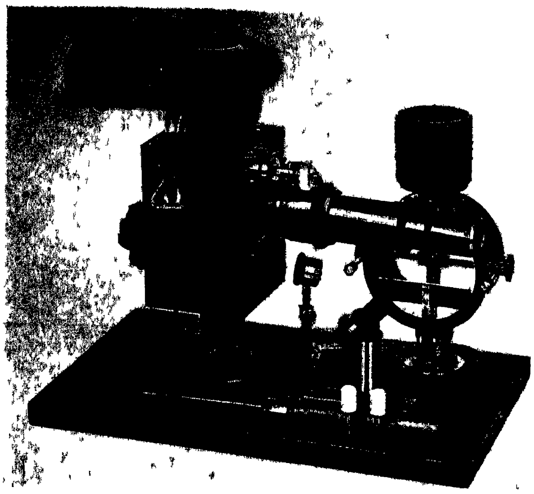
FIG 29—Plan and elevations of recording electrometer for atmospheric potential-gradient registrations (All dimensions given in milimeters)

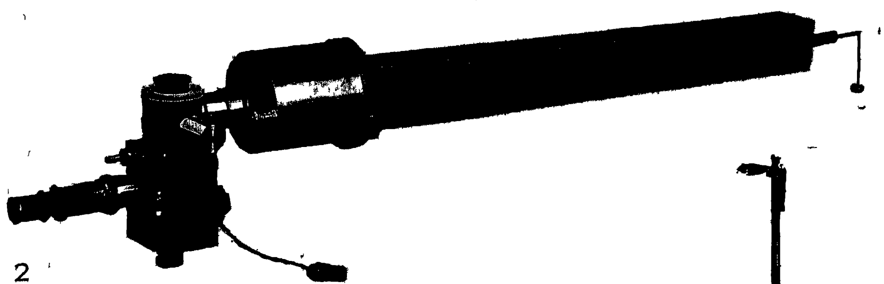
long arm provided with a pen attached to the lemniscate A contact-watch closed an electric circuit every fourth minute, and by means of an electromagnet, operating a lever, the pen was pressed down to the paper on a revolving drum, making a mark with ink The drum revolved once in 24 hours with a time scale of 11 mm corresponding to one hour A further description does not appear necessary, nor is it necessary to detail the many difficulties which had to be overcome and the many experiments which were undertaken before the instrument worked properly, but a few may be mentioned The arrangement of the quadrants, of the damping, and of the connection from the collector, and the construction of the recording unit did not present great difficulties, but such arose when perfect electrostatic insulation was to be insured and suitable sensitivity was to be provided We had no supply of amber for insulation and an amber pipe-stem was sacrificed and cut up into the necessary pieces. However, these pieces could not be shaped so that they could be placed where they could be cleaned easily This circumstance proved to be a great drawback and caused considerable inconvenience, because the instrument had to be taken apart and reassembled frequently in order to clean the insulating parts

The sensitivity could be regulated either by changing the potential applied to the quadrants or the suspension-fiber of the lemniscate Using a bifilar silk-fiber suspension and applying a potential of about 110 volts to one quadrant-pair, the sensitivity was adjusted to make 1 mm correspond to about 6 5 volts, thus making the recording range about 550 volts The potential on the quadrants was supplied by a battery composed of flash-light dry cells The chloride-of-silver batteries were entirely destroyed by the moisture during the summer of 1923, but fortunately we had a great number of dry cells of the type which had to be filled with electrolyte before being used These dry cells in 1918 were presented to the Expedition by the firm Hellesen Enke and V Ludvigsen, Copenhagen, and were originally intended to be attached under a pilot-balloon during night ascents to provide current for a flash-light lamp which could be followed by theodolite However, small paper lanterns were found far more practical for this purpose, but the dry cells became invaluable for the atmospheric-electric work

(5) INSTALLATION AND OPERATION OF THE RECORDING ELECTROMETER

The experiments with the new electrometer were made in August and September 1923, and in October 1923 it was ready for use It was installed in an unheated room on deck to which connection from the collector was brought through one of the wall-insulators It was evidently of advantage to have practically the same temperature in the recording room as outdoors, because no deficiency of the insulation due to temperature differences between the two ends of the wall-insulator arose On the other hand, the observer was subject to some discomfort when attending to the instrument at low temperatures, when changing the paper on the drum, or when cleaning the inconveniently placed insulating parts of the electrometer. The collector was placed on top of a building which extended out from the side of the ship and was 6 meters above the ice This distance was so great that a small change in the immediate surroundings of the ship caused by accumulation of snow did not affect the potential In the fall of 1924 the collector was so placed that it reached farther out from the side of the ship, and for this reason the reduction-factor became smaller during the winter 1924 to 1925 than during that of 1923 to 1924 The battery which supplied the potential on one quadrant-pair was placed in the laboratory with one terminal connected to earth and the other leading to the recording electrometer The potential on the quadrant was checked twice a day by connecting this terminal to electrometer 3537 The atmospheric-electric potential was also read from two to six times a day by means of electrometer 3537 in order to keep the scale-value of the recording electrometer under control A linear relation between the potential and the ordinate of the curve was found over the whole range





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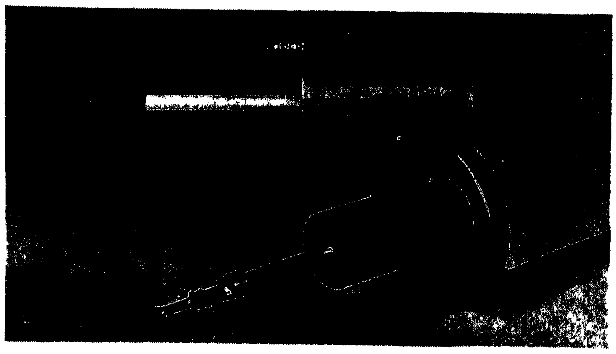

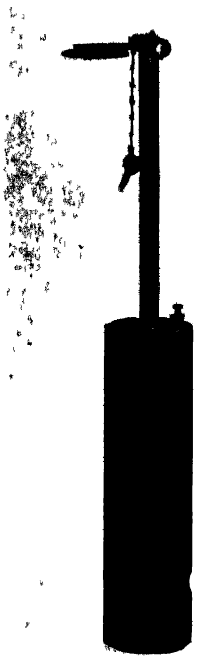

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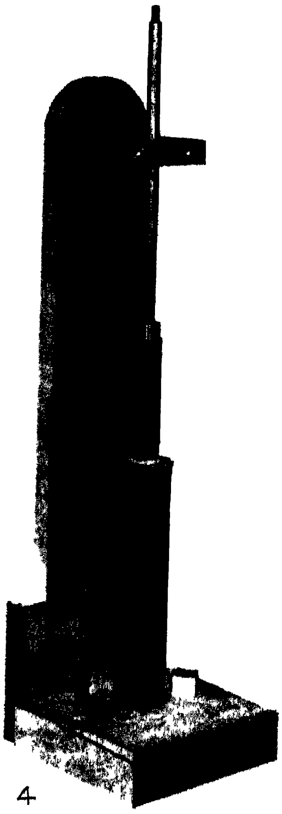

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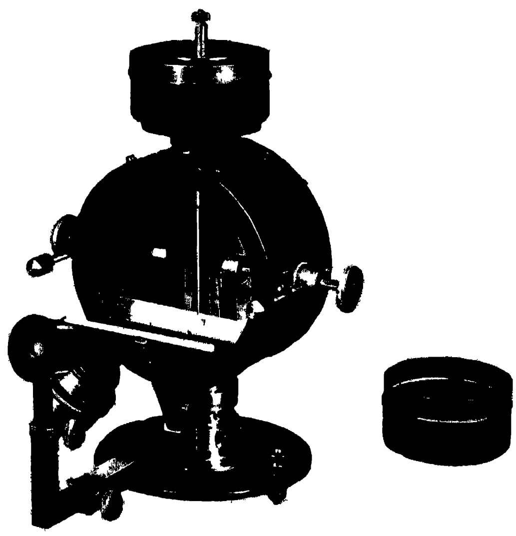

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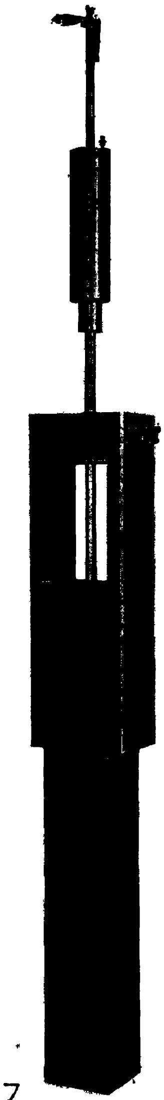


7

POTENTIAL-GRADIENT EQUIPMENT USED ON "MAUD" EXPEDITION

1 String and leaf electrometers with accessories
3 Post-insulator with cover removed
4 Insulator mounted in jig for recasting sulphur insulation
5 Inner and outer members of baffle-chamber
6 Aluminum-leaf electrometer and protecting cap
2 Assembly of electrometer, baffle-chamber, and wall-insulator
7 Assembled post-insulator

In order to obtain a record of the base-line, an alarm clock was attached to the inner protecting cap of the wall-insulator The hour-hand of the clock was provided with an arm which once an hour touched the connection from the collector and earthed this for a period of such length that two or three points corresponding to collector to earth were recorded This device was later changed so that the collector was connected to earth once in four hours A contact-watch, which was placed in the laboratory, closed the electric circuit which operated the electromagnet of the recording device every fourth minute

The capacity of the whole recording system was so great that it was found necessary to combine three ionium collectors in order to get the system loaded to the potential of the air in a reasonably short time This collector was sufficiently active as long as it remained free of frost, but the least deposit of frost reduced the activity very much Presence of frost became evident on the records by the slow rise of the potential after the collector had been earthed Generally it could be kept clean by taking it indoors for drying twice a day, but occasionally the formation of frost was too rapid and the record was spoiled.

The reduction-factor was determined by observing the potential gradient with electrometer 3537 over smooth ice at a sufficient distance from the ship for a period of 20 minutes and scaling the recorded potential for the same period

The recording electrometer was in operation during two periods, from October 1923 to the beginning of May 1924 and from November 1924 to April 1925 No records could be obtained during the period May to September on account of the great dampness of the air Technical difficulties delayed the beginning of the recording in the fall of 1924 and warm weather brought the temperature above the freezing-point in the recording-room during the latter part of April 1925, making the maintenance of proper insulation impossible. The records show in these periods a large number of breaks, partly due to mechanical imperfections of the recording electrometer and partly to the weather conditions With strong winds accompanied by snow-drift the potential always increased so much that the pen went off the drum and, during nights with excessive frost formation, the activity of the collector was reduced or the collector was short-circuited by ice-crystals forming on the protecting cap of the insulator to the supporting rod The number of successful records in spite of these breaks is so large that the time devoted to the construction of and attendance to the recording electrometer has been well invested

During the winters 1923 to 1924 and 1924 to 1925, G Olonkin took all observations for reduction-factor at the field station, while the writer attended to the recording electrometer

(6) REDUCTION-FACTORS

In order to convert the observed or recorded potentials to potential gradients in volts per meter, it was necessary to determine the reduction-factors by observing the potential gradient over smooth ice These observations were carried out in the ordinary way by suspending at a measured distance from the surface a collector on an insulated wire, which was stretched between two poles The poles were placed in carefully selected locations where the surface of the ice was almost level and where the distances to the nearest pressure-ridges, which were 2 to 3 meters high, were from 30 to 100 meters The locations were 200 to 400 meters removed from the ship In the winter of 1922 to 1923 the reduction-factor was determined by simultaneous observations of the potential with electrometer 1443 at the field station and 3537 in the ice house, both instruments being read once a minute for a period of 20 minutes. During the winters of 1923 to 1924 and 1924 to 1925, the reduction-factor was determined by observing the potential gradient at a field station for a period of 20 minutes with 3537 and comparing the average value for this period with the potential recorded simultaneously by the quadrant electrometer

The observed potential gradients and potentials and the computed reduction-factors are shown in Table 50 for the three periods of observation. For the first period, winter 1922 to 1923, eight series of observations are available, of which six agree very well, while two give apparently high values. For this period the simultaneous variations of

TABLE 50—*Observations of the Reduction-Factor*

Date	Time GMT	Potential gradient	Observed or recorded potential	Reduction-factor B	Weight
1922	h m	v/m			
Nov 3	22 12	120	198	0 61	2
6	22 26	98	123	0 80	1
16	0 10	120	149	0 81	0
23	23 57	128	214	0 60	3
1923					
Feb 6	1 01	108	192	0 56	2
21	0 01	120	185	0 65	3
Apr 11	22 45	132	223	0 59	2
21	0 22	105	166	0 63	2
Weighted mean		...	...	0 62	.
Oct 25	0 48	112	138	0 81	
Nov 19	1 25	100	118	0 85	
20	0 07	82	94	0 87	
21	0 01	83	99	0 84	
30	0 44	86	104	0 83	
Dec 5	1 14	88	113	0 78	
7	0 38	115	153	0 75	
10	1 10	116	138	0 84	
1924					
Feb 25	0 46	102	131	0 78	
Mar 10	23 22	124	130	0 95	
14	23 04	91	122	0 75	
20	23 12	121	169	0 72	
25	23 34	100	141	0 71	
26	5 20	77	105	0 73	
29	0 40	111	188	0 59	
Apr 12	0 20	100	139	0 72	
Mean				0 78	.
Nov 12	23 08	77	134	0 57	
14	0 00	99	181	0 55	
30	23 50	57	86	0 66	
Dec 3	0 46	82	138	0 59	
4	0 06	87	148	0 59	
14	23 30	81	150	0 54	
1925					
Jan 19	0 40	57	101	0 56	
23	23 49	73	126	0 58	
26	23 36	63	89	0 71	
29	1 04	50	59	0 85	
Feb 19	1 04	88	166	0 53	
24	0 34	114	176	0 65	
Mar 3	23 40	106	172	0 62	
Apr 8	1 00	80	166	0 48	
30	23 46	94	180	0 52	
Mean			.....	0 60	..

the potential at the field station and at the observatory were compared by plotting the values for every minute on coordinate paper. The factors were then assigned weights and entered in the table according to the agreement between the variations, assuming that this agreement indicated identical conditions at both stations[3] The observation

[3] J P AULT and S J MAUCHLY Atmospheric-electric results obtained aboard the *Carnegie*, 1915–1921, *Res Dep Terr Mag*, vol V (1915–1921), pp 195–209

of November 16 was excluded, because there was no agreement between the variations On November 6 the agreement was only fair, but on the other days it was good or excellent Thus the weighted mean value, 0 62, has been adopted as the reduction-factor for the winter 1922 to 1923

It may here be noted that the collector-post was placed 3 7 meters from the ice house on level ice The collector was 180 cm above the surface and the height of the house was about 2 meters Supposing the house to be absent, we should have found the reduction-factor equal to 1/1.80 = 0 56, but this value is increased by 10 per cent to 0 62, owing to the presence of the house. We may get an idea of the increase which should be expected by applying the formulæ which C H. Lees[4] has developed for the potential in the vicinity of the middle of long walls Considering the ice-house as a long, thin wall of height 2 meters and at a distance of 4 meters from the collector-post, we find that the measured potential has to be multiplied by 1 11 in order to be reduced to undisturbed conditions, that is, the reduction-factor r is equal to 0 56×1 11 = 0 62. Considering, on the other hand, the ice-house as a long retaining-wall, we find that the measured potentials must be multiplied by 1 24, giving r = 0 70 The latter value is obviously too large, because the ice-house was of short length compared to the distance to the collector The first value may be more nearly correct, because, though the house is short, it has a certain depth Considering these circumstances, the agreement between the observed values and the computed values must be regarded as satisfactory

In the next two periods no discrimination between good and bad observations was possible, because the potential at the observatory was recorded every fourth minute only and because the small time-scale made the identification of corresponding potentials difficult The observed reduction-factors for these periods show greater scattering, which is due, at least partly, to the imperfections of registration, namely, small time-scale and uncertainty as to base-line The mean values 0 78 and 0 60 which have been adopted for the two periods, the winter 1923 to 1924 and the next winter, respectively, are probably correct, however, within 5 per cent, because the probable errors of these values are ±1 8 per cent and ±2 6 per cent, respectively

The difference in the values for the two winters is explained by the circumstance that the collector during the winter 1924 to 1925 extended farther out from the side of the ship than during the preceding winter The potential recorded at the same altitude above the surrounding, ice, therefore, would become higher and consequently the reduction-factor smaller

It may be noted that it is not possible to detect any definite departure from a linear relationship between observed or recorded potential and potential gradient Furthermore, no material seasonal change in the value of the reduction-factor is present. A seasonal change might be caused by an accumulation of snow near the ship, which would be accompanied by an increase of the reduction-factor. The observations seem rather to indicate a decrease, but this is too small and uncertain to be taken into account.

(7) TABLES OF RESULTS

Table 51 contains the results of the daily observations from October 11, 1922 to May 30, 1923. In the first part is given the Greenwich date, the G M T of the observation, and the potential gradient in volts per meter. The last part contains an abstract of the meteorological observations, namely, the true direction of the wind, the wind velocity in meters per second, the temperature of the air in degrees centigrade, the amount of cloudiness on a scale of 10, and statements regarding occurrence of fog or precipitation The barometric pressure has not been entered, because it is a factor of small importance in the

[4] C H Lees On the shape of the equipotential surfaces in the air near long walls or buildings and on their effect on the measurement of atmospheric potential-gradient, *Proc R Soc*, A, vol 91 (1915), pp 440–451

TABLE 51—*Simultaneous Values of Potential Gradient, Wind-Direction and Velocity, Temperature, and Cloudiness while in the Drift-Ice*

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1922	*h m*	*v/m*		*m/sec*	°	
Oct 11	21 36	108	NE	3 1	−12	9
12	21 10	130	NE	6 4	−15	1
13	21 10	102	ENE	9 3	−10	10
14	21 00	230	E	7 6	− 9	9
15	22 02	142	NNW	2 0	−13	5
16	21 28	132	W	4 9	−16	7
17	22 06	103	E	3 1	−16	8
18[a]	21 05	86	E	4 7	−14	10
19	22 09	38	ESE	6 1	− 6	8
20	22 21	62	SE	6 4	− 5	8
21[b]	22 09	81	E	3 6	−11	10
22	22 19	67	E	5 4	−16	10
23	22 16	99	ENE	5 0	−15	4
24	22 00	122	NE	6 9	−22	2
25	22 15	104	E	5 9	−23	0
26	22 17	128	E	3 8	−19	1
27	22 14	105	S	3 5	−15	10
28	22 15	45	ESE	5 6	−17	10
29	22 35		E	8 8	−18	3
30	22 13	123	ESE	6 4	−17	8
	h					
Mean	22 0	106	For all			
Mean	22 0	100	For wind-velocity less than 6 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1922	*h m*	*v/m*		*m/sec*	°	
Nov 3	22 12	123	NW	2 5	−23	1
4	22 10	92	WNW	4 0	−23	1
5	22 00	85	•	0 0	−22	10
6	22 14	77	NW	2 9	−20	10
7	22 11	76	N	2 0	−20	10
9	22 24	92	W	7 8	−26	10
10	22 13	99	NW	1 2	−32	1
11	22 30	177	ENE	7 3	−25	10
12	22 11	83	ENE	4 7	−23	10
13	22 00	75	S	2 5	−21	10
14	22 20	83	E	2 4	−25	10
15	22 16	112	SE	1 5	−21	10
16	0 07	92	ENE	0 0	−23	
16[a]	22 21	130	ENE	4 2	−23	10
17	22 09	57	E	3 5	−25	1
18	22 11	83	SE	2 3	−24	1
19	22 07	66	NE	4 2	−29	1
20	22 00	109	N	2 4	−24	10
21	22 08	116	NW	3 8	−22	10
22	22 07	123	WNW	3 1	−29	2
23	22 14	165	NE	2 4	−33	1
23	23 57	132	NE	2 4	−33	1
24	22 15	258	N	3 7	−26	10
25	22 46	251	NE	6 1	−19	10
26	22 11	113	SSE	4 4	−30	2
27	22 00	148	E	2 0	−34	2
28	22 25	249	E	7 8	−18	5
29	22 10	165	NE	3 7	−27	1
	h					
Mean	22 2	122	For all			
Mean	22 2	111	For wind-velocity less than 5 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1922	*h m*	*v/m*		*m/sec*	°	
Dec 2	22 10	93	S	2 2	−32	2
3[e]	22 05	99	NE	3 2	−20	10
5	22 22	93	SW	3 8	−28	1
7	21 40	126	WNW	4 1	−21	10
8	22 11	84	E	4 3	−24	10
10	22 30	68	ESE	5 0	−19	7
11	22 00	135	ESE	4 1	−21	0
12[a]	22 22	160	N	1 6	−19	10
13	22 10	95	ENE	4 8	−24	5
16	22 25	116	E	4 9	−25	1
17	22 20	133	E	3 8	−25	1
18	22 00	119	E	2 2	−27	2
19	22 04	137	E	1 0	−26	4
20[c]	22 08	94	NNW	0 9	−22	10
22[c]	22 21	126	WNW	2 0	−25	10
23	22 24	130	NW	2 0	−33	1
26[d]	22 30	153	NE	1 5	−27	10
27	22 25	97	NW	3 4	−32	6
29	22 29	76	N	2 8	−32	3
30	22 25	90	N	2 6	−28	5
31	22 30	73	NE	2 3	−32	10
	h					
Mean	22 3	109	For all			
Mean	22 3	109	For wind-velocity less than 5 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1923	*h m*	*v/m*		*m/sec*	°	
Jan 1	22 22	87	ENE	3 7	−33	1
2	20 00	228	ENE	5 7	−32	2
5	22 17	138	WSW	2 2	−33	6
6	22 59	143	NW	1 9	−32	7
7	22 32	137	E	3 5	−29	10
8	22 00	150	ESE	0 7	−31	8
9	22 41	128	ENE	2 4	−27	10
10	22 14	127	SSE	1 0	−36	1
11	22 10	106	SW	1 6	−40	1
12	22 26	100	N	1 8	−41	7
13	22 33	107		0 0	−41	1
17	22 23	107	ESE	4 1	−36	10
22	22 56	81	SE	2 8	−37	4
23	22 00	143	ENE	1 6	−42	1
24	22 26	128	N	0 6	−42	1
25	22 30	169	SSW	3 4	−37	2
27	22 39	83	SW	3 4	−29	9
28	22 36	85	NNW	1 0	−31	10
29	22 34	171	ENE	5 7	−37	1
30	22 36	75	E	6 0	−39	1
31	22 17	157	E	7 0	−36	1
	h					
Mean	22 4	126	For all			
Mean	22 6	119	For wind-velocity less than 5 0 meters per second			

[a] Fog [b] Snow [c] Mist [d] Heavy fog [e] Light snow

TABLE 51—*Simultaneous Values of Potential Gradient, Wind-Direction and Velocity, Temperature, and Cloudiness while in the Drift-Ice*—Concluded

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1923	*h m*	*v/m*		*m/sec*	°	
Feb 1	22 41	135	ENE	7 0	−34	10
2	22 35	102	NE	2 9	−36	5
3	22 55	117	WSW	2 5	−35	7
4	22 15	88	SSW	3 4	−31	10
5	22 00	127	SSW	1 2	−37	1
6	22 20	110	SSW	4 7	−28	4
7	22 21	83	SSW	2 8	−28	2
8	22 28	74	SSE	2 0	−31	1
13	22 33	47	SSE	3 0	− 9	10
14	22 30	147	W	2 0	−21	2
15[a,b]	22 14	104	NNE	3 2	−20	10
16	22 24	136	E	1 5	−27	2
17	22 37	93	E	4 8	−29	2
19	22 46	84	S	3 8	−17	2
20[c]	22 00	117	SW	1 2	−28	10
26	22 01	159	SW	3 6	−35	2
28	22 15	125	WNW	4 4	−21	9
	h					
Mean	22 4	109	For all			
Mean	22 4	107	For wind-velocity less than 5 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1923	*h m*	*v/m*		*m/sec*	°	
Mar 1	22 45	107	SSW	1 9	−24	10
2	22 43	98	W	3 5	−28	2
3	22 30	151	SW	2 9	−30	2
10	22 51	92	S	1 5	−36	0
11	22 14	124	ENE	5 5	−34	10
12	22 52	119	NE	2 9	−32	5
14	21 58	159	W	2 2	−35	0
15	22 35	123	SSE	1 5	−33	0
16	22 15	141	ESE	0 9	−33	0
17	22 49	140	SE	2 3	−34	0
18	22 35	123	SE	2 0	−34	4
19	22 30	186	SE	1 8	−34	0
20	22 45	135	ESE	4 8	−30	5
22	22 19	135	ESE	2 8	−33	3
24	22 15	116	ESE	6 8	−24	10
27	22 10	128	SW	3 5	−26	0
28	22 27	120		0 0	−24	1
	h					
Mean	22 5	129	For all			
Mean	22 5	130	For wind-velocity less than 5 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1923	*h m*	*v/m*		*m/sec*	°	
Apr 6	23 33	140	E	6 0	−21	2
7	23 28	139	ESE	4 8	−21	7
8	23 13	169	S	2 4	−18	3
9	23 00	181	SW	1 8	−20	1
11	23 46	145	WSW	2 4	−22	1
12	23 22	151	SW	2 0	−22	2
13	23 27	154	NW	0 6	−19	10
15	23 00	150	N	0 9	−25	2
16[e]	22 16	153	SSE	1 2	−25	10
17	22 01	137	SE	4 7	−27	1
18	22 10	139	E	4 8	−27	2
19	22 25	140	ESE	3 4	−25	0
21	00 22	103	NW	0 9	−23	2
21	22 39	86	NW	1 7	−23	2
22[e]	22 18	91	NNW	2 2	−22	10
23	22 24	62	WNW	2 9	−19	10
24	22 01	94	E	1 3	−24	6
25	22 02	97	E	8 0	−21	2
	h					
Mean	22 2	130	For all			
Mean	22 2	131	For wind-velocity less than 5 0 meters per second			

Date	G M T	Potential gradient	Wind True dir	Wind Velocity	Temperature, centigrade	Cloudiness
1923	*h m*	*v/m*		*m/sec*	°	
May 1	22 43	116	ESE	8 0	−20	3
4[e]	22 26	85	SSW	3 6	−13	10
5	22 30	151	WSW	2 9	−18	1
6	22 39	115	WSW	0 9	−14	10
7[e]	22 50	127	SSW	1 1	−17	10
8	22 44	158	E	5 3	−11	5
9[e]	22 37	102	ENE	4 4	−10	10
10	22 48	159	NE	7 2	−15	1
14[b]	22 00	71	ENE	7 3	−11	10
16	22 32	203	NW	6 8	−13	3
19	22 38	125	N	5 5	−13	8
21	22 08	147	SW	6 8	−13	0
23	22 00	123	NW	1 6	−14	2
24	22 28	106	NW	0 7	−12	1
25	22 22	105	E	3 7	−11	10
26	22 36	93	E	2 9	− 6	10
28	21 58	96	SE	2 9	− 7	1
29	22 15	123	SE	3 2	− 6	2
30	22 09	124	SE	6 4	− 6	1
	h					
Mean	22 5	123	For all			
Mean	22 5	111	For wind-velocity less than 5 0 meters per second			

Means October 1922 to May 1923 at 22^h 4, 119 1 volts per meter, days without drift at 22^h 4, 114 5 volts per meter

[a] Fog [b] Snow [c] Mist [d] Heavy fog [e] Light snow

study of the potential gradient and because possible relations between atmospheric pressure and potential gradient will not be discussed in the present paper The relative humidity has also been omitted, because reliable measurements of this quantity are very difficult at low temperatures and are not available for the winter 1922 to 1923 F Malmgren succeeded later on (fall of 1923), in developing a method by which the relative humidity could be measured with great accuracy at very low temperatures [5] Some of his results will be utilized when discussing the observations of the two winters 1923 to 1925

Table 52 contains the results of the 24-hour series of eye-readings for determining the diurnal variations The potential gradients are entered for every Greenwich hour and

TABLE 52—*Hourly Values of Potential Gradient in Volts per Meter*

Day	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h
1922															
Oct 17			102	110	112	110	116	94	93	88	104	90	114	(125)[a]	(136)
18	98	101													
24															
25	[164	110	104	108		199									
Nov 5															
6	60	47	41	40	57	46	35	55	72	78	58	104	97	91	58
13															
14	113	71	76	63	85	63	(65)[b]	(65)	66	62	89	92	90	97	117
21															
22	81	78	73	67	64	89	104	109	98	78	90	89	107	116	124
27															
28	120	118	115	122	123	136	127	115	108	116	121	104	144	111	149[c]
Dec 11															
12	[104	97	98	112	122	130	157	121	113	130	199	250	161	148	221
18			92	105	116	114	111	112	104	101	110	125	125	130	131
19	104	108													
1923															
Jan 7															
8	106	97	120	112	119	79	90	127	156	166	135	160	154	198	204
23				[76]	77	77	73	89	97	100	113	138	141	146	158
24	98	104	99	100											
Mean	97 5	90 5	89 8	89 0	94 1	89 2	90 1	95 8	99 2	98 6	102 5	112 8	121 5	126 8	134 6
Feb 5					84	100	105	100	100	88	98	97	115	126	118
6	119	121	126	115											
20															
21	110	111	116	101	141	81	84	77	50	103	84	102	90	100	95
25															
26	107	97	104	109	95	91	96	78	72	92	103	129	160	176	198
Mar 4															
5	[120	120	123	117	126	106	114]								
13															
14	147	134	118	125	130	126	122	125	154	143	157	148	166	175	193
Apr 9				133	138	141	152	150	155	134	144	152	164	193	187
10	136	134	136												
16															
17	[110	107	109	109	102	116	126	136	131	100	85	62	71	55	50
24															[65
25	102	92	89	98	91	82	79	91	70	65	38	19	4	6	23
May 14					120	125	125	158	154	147	141	101	25	14	8
15	178	157	141[c]	98											
22															
23	120	141	100	101	108	91	100	96	82	87	89	99	104	76	66
Mean	127 4	123 4	116 2	110 0	113 4	104 6	107 9	109 4	104 6	107 4	106 8	105 9	103 5	108 2	111 0

( ) =Interpolated [ ] =Not used in the mean [a] Mist [b] Fog [c] Snow [d] Light snow

[5] Studies of humidity and hoar frost over the Arctic Ocean, *Geofysiske Publikationer*, Oslo, vol IV, No 6 (1926)

are obtained as the mean of 20 readings at intervals of one minute, centered on the hour. The right part of the table gives notes regarding the meteorological conditions, namely, the maximum and minimum mean hourly wind-velocity during the period of observation, the general wind-direction, and the maximum and minimum amount of clouds The footnotes show snowfall and the occurrence of fog and haze The meteorological data are too condensed to show some of the relations which will be discussed in the following section For more detailed and complete information, reference must be made to the forthcoming complete publication of the meteorological observations of the *Maud* Expedition

from Eye-Readings, October 1922 to May 1923 (Greenwich mean time)

Day	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h	24^h	Mean	Wind			Clouds	
											Max	Min	True direction	Max	Min
1922											*m/sec*	*m/sec*			
Oct 17	156	132	162	132	146	106	104	93	94		3 2	0 0	W, E	10	1
18															
24					[118	120	123	188	99]		5 3	4 8	NE	5	2
25															
Nov 5						99	86	69	58		2 3	0 0	N	10	1
6	66	64	84	92	97										
13					108	94	76	66	51		4 1	0 0	SW, E	10	7
14	136	148	113	115											
21					137	113	109	90	87		4 2	2 3	NW	10	0
22	135	134	140	132											
27					172	154	148	142	118		7 4	1 7	NE	10	0
28	157	143	123	141											
Dec 11					[135	141	135	116	107]		4 1	0 9	SE, NW	10	0
12	162	95	144	149]											
18	130	134	93	136	135	136	119	101	102		4 1	2 2	E	4	0
19															
1923															
Jan 7									122		4 1	0 0	E	10	3
8	190	177	156	175	150	149	150	138							
23	149	181	190	161	165	148	143	123	126		3 0	1 6	E	2	0
24															
Mean	139 9	139 1	132 6	135 5	138 8	124 9	116 9	102 8	94 8	110 8					
Feb 5	144	130	108	116	132	147	128	132	131		2 2	0 0	W	2	0
6															
20							118	121	115		4 3	0 0	NE	10	2
21	83	120	108	110	97	103	[101]								
25								127	122		3 1	0 6	S	2	0
26	204	205	190	201	187	167	160	[147]							
Mar 4									[136]		4 9	1 0	NE	10	10
5															
13								[171	180]						
14	197	191	182	189	185	171	159	130	110		2 8	1 1	W	2	0
Apr 9	200	210	236	234	234	207	182	177	163						
10											2 4	0 0	SW	2	0
16									[135]						
17	47]					[160	138	126]^d			4 7	1.2	SE	10	4
24	60	22	17	90^b	233	146	94]	92	96						
25	4	19	31	35	77	82	98				7 0	0 0	E	10	2
May 14	6	4	11	10	30	37	72	100^c	144						
15											7 3	1 1	SE	10	0
22								119	130						
23	58	25	118	126	106	138	119	[126]							
Mean	112 0	113 0	123 0	127 6	131 0	131 5	129 5	124 8	126 4	115 8					

( ) = Interpolated [ ] = Not used in the mean ^{a} Mist ^{b} Fog ^{c} Snow ^{d} Light snow.

Table 53 contains the potential gradients which are derived from the continuous records during October 4, 1923 to May 5, 1924, and from November 1, 1924, to April 29, 1925 The published values represent hourly mean values centered on the full hours, G M T It is the practice of the Department of Terrestrial Magnetism to publish mean hourly values which are centered on the half-hour, the scaling of these records, however, was carried out by the writer on board the *Maud*, following the method which is com-

TABLE 53—*Mean Hourly Values Centered on the Hour of Potential Gradient in Volts*

Day	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h
1923																
Oct 4	(121)	124	113	107	141	104	115	124	137	150	129	124	153	156	[d]161	187
5	[102	94	[d](85)	75	94	91	91	113	125	107	[d]110	107	91	134	134	145
6	129	129	[c]135	109	117	132	117	117	103	109	106	106	113	111	131	129
7	53	74	37	42	63	(78)	(85)	(93)	95	101	[d]103	101	101	109	113	127
8	106	108	127	140	148	130	113	81	75	75	84	88	108	113	127	116
9	83	86	88	88	78	92	100	95	111	133	[c]133	127	127	148	159	139
10	141	135	124	113	99	118	115	109	109	101	104	109	107	124	[d]116	104
14	[107	115	118	105	70	47	26	31	28	15	28	53	86	128	136	158
18	(95)	(90)	87	81	85	93	93	87	85	85	90	105	117	134	134	152
19	(112)	(112)	109	106	106	109	112	118	118	76	88	97	109	100	112	112
20	[128	126	129	112	112	112	94	100	100	106	130	135	159	212	165	141
21	112	117	117	124	114	114	114	112	112	109	112	112	127	130	135	130
22	83	71	65	65	62	59	47	47	53	59	47	77	77	179	107	131
23	[102	96	93	90	99	112	121	121	121	124	130	139	148	158	194	258
24	121	134	141	134	121	121	115	110	105	99	105	122	147	124	115	120
25	[129	139	134	145	115	145	134	102	107	107	150	150	132	161	172	214
Mean	105 1	107 3	103 9	100 8	103 1	104 6	102 4	99 4	100 3	99 7	100 1	106 2	116 9	129 8	128 2	131 6
1923																
Nov 9	[111	100	94	97	108	111	111	111	117	127	127	134	147	150	138	167
10	[92	81	(81)	(85)	101	106	129	115	106	109	124	124	135	(149)	180	195
11	[104	110	110	104	104	102	111	126	104	102	121	148	(181)	187	(192)	192
16	[230	154	154	154	165	176	181	121	110	99	110	104	121	132	132	143
17	63	48	48	56	72	82	82	80	80	82	91	88	101	109	109	112
18	102	110	102	88	88	99	99	88	107	110	115	120	163	183	195	241
19	123	110	88	99	95	102	88	94	105	94	94	102	135	110	115	126
20	78	78	[c]70	63	63	95	[c]95	88	84	84	[c]78	115	126	118	[c]110	110
21	74	85	74	90	88[c]	85	74	53	53	58	63	77	95	106	112	106
23	[76	152	84	70	65	65	78	73	76	76	89	94	94	92	92	94
24	92	95	95	92	89	81	68	76	67	58	63	47	42	89	84	84
25	69	69	69	71	74	76	76	82	76	74	79	87	101	117	117	111
26	79	74	74	71	71	74	74	76	79	82	87	90	90	110	110	117
27	77	77	68	63	58	68	98	82	85	90	79	95	106	95	138	132
29	68	37	53	37	45	58	45	47	47	60	63	92	106	95	90	90
30	78	73	64	70	75	70	73	70	64	73	81	97	102	110	108	106
Mean	82 1	77 8	73 2	72 7	74 4	80 9	79 3	76 0	77 0	78 6	81 2	91 8	106 1	112 9	117 2	121 4
1923																
Dec 3	126	117	126	134	109	111	106	94	99	109	109	109	109	109	112	112
4	[(113)	(96)	(85)	76	79	79	85	85	88	93	85	102	113	113	119	[c]116
5	85	93	96	104	99	113	118	[c]118	102	93	93	[c]102	96	96	102	107
6	79	79	82	85	90	93	96	99	96	96	102	107	113	116	113	119
7	116	129	113	[c]107	124	131	135	133	124	133	124	[c]138	145	147	147	161
8	[149	127	130	(130)	(130)	(130)	(130)	130	127	124	130	145	156	156	159	147
9	110	104	104	113	110	110	124	121	127	127	134	129	141	158	147	152
10	107	107	107	113	121	127	130	130	124	121	127	133	138	147	152	150
11	96	93	112	116	121	118	124	124	121	101	95	95	107	113	118	118
12	126	120	115	124	129	124	124	126	124	129	126	129	132	143	143	146
13	102	95	107	102	102	95	99	113	113	110	99	[c]99	113	129	129	(141)
14	124	124	127	[c]116	116	133	130	138	130	119	133	147	164	167	147	[c]147
18	84	78	84	89	92	98	95	89	84	73	84	95	106	101	112	129
19	104	113	107	104	107	110	113	113	113	116	119	122	127	141	147	156
21	96	110	99	99	107	113	124	130	124	119	124	119	124	127	131	124
26	[183	163	124	[d]118	120	115	87	95	92	98	98	106	118	129	129	135
27	[166	141	117	136	117	111	99	97	117	72	99	111	133	141	141	161
28	[111	83	83	85	83	85	120	108	99	83	85	94	111	189	189	189
29	74	60	60	68	66	60	55	52	52	60	71	63	66	66	74	77
30	[85	82	74	63	66	68	74	79	77	82	85	[d] 88	118	143	115	159
Mean	102 1	101 6	102 8	105 3	106 6	109 7	112 5	112 9	109 5	107 6	110 0	113 4	120 1	125 7	128 1	131 4

( ) = Interpolated [ ] = Not used in the mean [a] Mist [b] Fog [c] Snow [d] Light snow [e] Haze

mon in meteorology, and it was not thought necessary to undertake new scalings centering on the half-hour. The "electric character-number" has been assigned in an arbitrary manner which is not in agreement with the scheme generally used, because a negative potential-gradient occurred only once, so that all days except one should have received character-number "0" The character-number here used depends only upon the appearance of the curve, 2 meaning a very ragged, 0 a very smooth curve.

per Meter from Electrograms, October 1923 to April 1925 (Greenwich mean time)

Day	17h	18h	19h	20h	21h	22h	23h	24h	Electric character	Mean	Wind			Clouds		Temperature	Snowdrift
											Max	Min	True direction	Max	Min		
1923											m/s	m/s				°C	
Oct 4	166	164	^{d}139	145	129	129	118	107	1	135 1	6 1	2 4	W	10	2	−15	0
5	174	193	171	168	174	171	145	145]	2	126 6	7 0	4 8	SW	10	10	−12	1
6	121	106	116	113	101	117	50	58	2	111 5	5 0	0 9	SW	10	10	−12	0
7	138	146	146	132	120	106	108	106	1	99 0	4 0	2 4	W	10	10	−13	0
8	127	146	140	124	118	73	^{d}75	(81)	1	109 3	6 0	0 0	S	10	2	−15	0
9	145	156	^{c}159	150	138	145	[144]	(140)	1	123 5	6 7	2 4	SE	10	3	−16	0
10	107	124	^{b}70	79	90	95	^{b,d}105	102	1	108 3	7 9	3 1	SE	10	0	−16	0
14	189	163	168	184	199	216	234	239]	1	118 5	12 4	4 5	NE	10	10	− 8	1
18	161	164	161	161	153	125	130	124	0	116 3	5 3	2 1	NE	10	3	−13	0
19	88	(100)	112	120	118	130	127	135	1	109 4	6 1	3 0	NE	10	0	−13	0
20	135	106	165	168	153	141	112	124]	2	131 9	8 0	4 8	NE	10	10	−13	1
21	124	127	135	138	132	106	95	83	0	118 0	7 2	1 9	N	10	2	−18	0
22	125	119	127	125	125	113	106	99	1	90 3	5 3	3 5	NW	10	9	−16	0
23	273	224	321	181	163	145	145	127]	2	153 5	9 8	5 4	NW	10	4	−17	1
24	145	157	179	190	155	120	107	118	1	129 4	6 1	0 7	N	10	10	−18	0
25	214	241	226	209	209	198	174	131	2	159 9	5 6	0 9	SE	10	10	−17	1
Mean	131 6	137 2	134 9	134 3	125 4	114 4	105 9	104 8		113 7							
1923																	
Nov 9	177	(177)	(170)	(161)	(150)	(134)	(117)	(106)]	1	130 9	4 4	1 2	NW	10	0	−23	0
10	195	195	180	172	135	132	95	95]	1	129 6	5 6	2 5	NE	10	0	−25	(0)
11	192	181	170	168	146	99	99	66]	1	134 1	6 1	3 1	NE	10	0	−26	(1)
16	132	132	115	104	104	104	83	69]	1	130 4	5 9	0 0	E	10	0	−23	1
17	115	120	112	117	128	125	118	105	1	93 5	2 8	1 0	SE	7	0	−29	0
18	178	173	199	157	152	126	^{a}(118)	^{b}(110)	2	134 4	2 3	0 7	NE	3	0	−30	0
19	137	137	120	124	95	94	68	70	1	105 2	2 9	1 7	N	3	0	−32	0
20	137	139	141	157	84	78	(80)	77	1	97 8	1 9	0 0	N	10	3	−32	0
21	120	106	112	101	99	95	(93)	(85)	1	87 7	4 5	0 9	NW	10	1	−26	0
23	105	118	118	113	110	105	100	95]	1	93 1	6 1	1 9	S	9	0	−29	1
24	100	100	106	126	116	110	116	69	1	86 0	2 5	1 5	SW	10	0	−27	0
25	113	129	124	164	117	102	101	95	0	95 5	3 1	1 8	NW	4	0	−30	0
26	124	121	127	121	117	90	82	77	0	92 4	3 1	2 0	NW	10	1	−30	0
27	159	143	^{d}143	127	117	103	121	85	1	100 4	4 7	1 9	NW	10	10	−22	0
29	100	100	100	95	95	100	73	70	1	73 6	2 2	1 0	E	10	0	−27	0
30	97	108	108	110	102	86	97	110	0	88 8	2 5	1 0	E	0	0	−33	0
Mean	125 4	125 1	126 6	127 2	111 1	100 8	97 0	85 7		95 9							
1923																	
Dec 3	113	106	94	91	77	^{e}85	119	124	1	108 3	3 7	1 6	E	10	0	−31	0
4	133	133	136	^{e}127	113	110	90	^{e}90]	1	102 5	2 9	1 9	E	10	0	−32	0
5	113	119	129	129	119	107	93	85	1	104 6	3 0	1 3	NE	2	0	−34	0
6	130	148	156	^{e}167	159	135	113	^{e}(113)	0	111 9	2 9	1 5	NE	2	0	−35	0
7	181	187	190	178	176	167	141	152	0	145 0	3 7	1 1	N	4	0	−35	0
8	141	150	141	138	135	113	102	107]	1	134 5	2 4	1 7	N	2	0	−36	0
9	162	164	162	170	152	162	141	159	1	136 8	3 0	1 7	N	5	0	−36	0
10	147	141	145	145	136	116	99	99	0	127 6	3 0	1 9	NE	3	0	−39	0
11	124	118	124	113	118	118	146	135	1	115 3	4 1	2 2	NE	10	0	−38	0
12	163	166	149	149	141	132	113	110	0	132 6	4 7	2 3	NE	6	0	−36	0
13	(160)	163	152	147	138	135	135	^{e}124	1	120 9	4 0	1 0	E	3	0	−35	0
14	161	152	164	^{e}156	145	133	128	^{e}128	1	138 7	4 2	1 5	NE	4	0	−35	0
18	115	146	152	^{e}157	(148)	134	(119)	113	1	107 4	4 9	2 0	SE	2	0	−38	0
19	161	147	156	145	113	120	119	121	1	124 8	4 4	0 6	NE	5	0	−35	0
21	141	145	145	145	136	124	107	(100)	1	121 4	2 4	0 0	NW	6	0	−38	0
26	157	140	129	163	157	118	126	161]	1	127 5	4 7	0 0	SW	10	0	−29	1
27	134	172	156	156	133	125	106	88]	2	126 2	4 8	3 5	SW	10	0	−33	1
28	152	156	206	278	156	195	117	71]	2	130 3	4 5	3 2	S	7	0	−35	1
29	90	85	66	82	82	88	99	85	1	70 9	3 6	0 6	SE	10	0	−35	0
30	127	152	165	^{e}127	124	127	104	173]	2	106 5	3 5	1 8	N	10	0	−31	0
Mean	140 1	141 9	141 7	141 0	131 4	125 4	129 4	117 7		119 5					.	. .	.

( ) = Interpolated. [ ] = Not used in the mean. ^{a} Mist ^{b} Fog ^{c} Snow. ^{d} Light snow ^{e} Haze

TABLE 53—*Mean Hourly Values Centered on the Hour of Potential Gradient in Volts per*

Day	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h
1924																
Jan 5	81	70	70	54	62	70	76	81	84	98	98	101	109	127	120	117
6	90	81	81	81	79	87	87	81	87	84	87	92	98	103	109	112
7	81	76	70	60	70	70	60	62	79	98	109	123	136	147	145	[c]125
9	[196	120	95	87	79	87	87	87	98	120	131	141	134	127	156	169
11	[109	109	103	103	114	131	133	117	114	138	159	174	185	207	210	207
12	131	125	120	120	114	120	136	191	169	158	169	182	180	174	191	182
13	[109	109	106	101	101	109	117	117	131	136	141	138	158	166	174	[c]229
14	103	103	114	103	(103)	103	98	98	98	120	136	147	141	138	145	147
15	70	73	76	76	76	87	95	98	114	109	136	147	131	125	136	147
16	114	92	70	76	81	84	98	92	103	81	70	92	98	112	120	[c]109
17	92	90	90	87	84	92	92	109	109	101	103	127	147	134	127	131
20	[145	92	81	95	87	92	114	103	103	95	125	123	120	103	114	106
21	70	65	57	60	65	73	73	79	87	87	87	103	106	101	114	106
22	104	88	82	77	82	82	79	77	82	77	88	96	115	120	132	126
23	[157	308	320	157	106	115	106	112	112	92	101	106	112	115	123	123
24	[(94)	(88)	80	(74)	74	68	74[e]	80	85	85	82	117	132	126	149	143
26	[102	102	88	[a]99	79	120	96	113	116	102	113	119	156	159	265	[c]232
27	141	135	121	[a]99	90	85	90	96	85	104	79	104	141	110	124	124
28	79	79	93	107	85	87	96	96	67	79	85	85	90	85	107	[d]130
29	70	67	56	67	56	65	104	79	85	67	65	85	96	99	113	119
30	116	104	102	92	96	107	93	87	102	98	96	[c]93	119	121	124	113
31	85	90	88	88	85	88	102	107	99	110	113	119	113	122	138	136
Mean	95 1	89 2	86 0	83 1	81 9	86 7	91 9	95 5	96 7	98 1	101 4	113 1	121 3	121 2	129 7	128 3
1924																
Feb 2	112	112	124	132	141	138	132	[c]126	115	109	121	[c]138	124	135	129	[c]124
3	78	67	62	[c]62	64	73	75	[c]73	75	87	81	[c]90	90	95	84	[c]90
4	67	73	70	70	73	84	87	95	92	92	90	101	112	112	115	129
6	[219	213	216	169	121	118	115	124	129	121	124	134	129	129	143	140
7	124	117	117	112	109	106	104	106	106	104	106	101	115	109	112	118
8	[73	78	87	118	115	112	118	118	118	112	106	112	118	105	112	[c]118
9	[95	87	90	106	115	121	112	126	126	112	129	129	146	143	152	148
12	[95	107	127	119	119	124	187	65	65	59	107	[a]113	79	85	90	85
13	[88	107	91	[a]96	82	79	85	85	96	85	119	119	221	267	294	[a]273
14	[145	145	145	170	181	150	170	164	145	130	170	167	141	130	205	159
15	[122	102	107	99	107	113	124	124	121	124	147	150	153	147	145	153
16	[312	312	233	[a]295	290	283	198	[a]255	269	244	159	[d]182	156	166	187	[d]187
17	[136	127	122	122	127	131	124	124	119	105	96	108	119	124	122	136
18	85	96	91	91	102	116	102	131	136	148	148	141	148	156	159	170
19	136	119	116	105	102	127	113	136	139	131	116	96	110	113	120	122
20	65	85	76	73	88	88	85	90	73	79	107	[c]85	73	96	102	107
21	67	67	73	67	73	79	79	62	70	79	67	62	76	79	85	81
22	85	73	79	90	90	96	102	105	102	102	113	113	113	133	185	141
23	107	102	102	102	96	96	79	102	90	79	88	85	85	102	113	135
24	176	216	204	181	141	113	131	107	74	70	82	85	70	85	90	96
25	[102	93	90	90	90	93	85	79	79	88	96	96	121	135	141	187
26	[227	297	190	124	99	93	90	99	102	102	141	159	113	111	147	138
27	[153	141	161	119	107	88	93	90	96	102	96	90	105	113	127	99
28	[96	96	90	90	99	102	136	131	141	175	141	124	113	136	153	130
29	88	85	90	96	96	107	116	119	119	116	124	138	130	141	147	150
Mean	99 2	101 0	100 3	98 4	97 9	101 9	100 4	104 3	99 2	99 7	103 6	102 9	103 8	113 0	115 9	121 9

( ) = Interpolated [ ] = Not used in the mean [a] Mist [b] Fog [c] Snow [d] Light snow [e] Haze

The abstract of the meteorological data is similar to that in Table 52. It may be noted that from April 1925 only the wind-velocities which were estimated every fourth hour were available when preparing this report, the records for the last months in the ice not having been scaled.

DISCUSSION

The discussion of the results has been concerned largely with (1) relations of the electric potential-gradient of the atmosphere to meteorological factors, (2) monthly and diurnal variations of the potential gradient, (3) harmonic analyses of the results, (4) relation to auroral phenomena, and (5) comparison with results of other observations.

Meter from Electrograms, October 1923 to April 1925 (Greenwich mean time)—Continued

Day	17h	18h	19h	20h	21h	22h	23h	24h	Electric character	Mean	Wind Max.	Wind Min.	Wind True direction	Clouds Max.	Clouds Min	Temperature	Snow-drift
1924											m/s	m/s				°C	
Jan 5	131	152	138	134	131	117	106	98	1	101.0	7.2	0.0	S	1	0	−29	0
6	106	106	101	114	131	131	92	(81)	1	95.9	4.7	0.0	SW	0	0	−32	0
7	136	141	160	•174	180	156	138	125	1	113.4	4.4	0.9	N	2	0	−33	0
9	174	190	162	147	147	141	133	131]	1	130.9	8.2	4.3	NE	2	0	−29	1
11	199	210	207	210	191	191	177	147]	0	160.2	6.4	3.7	E	9	0	−30	1
12	180	193	188	•166	196	196	163	131	1	161.5	4.9	3.2	NE	1	0	−32	0
13	207	196	166	•147	145	147	136	125]	2	142.1	5.7	4.7	NE	0	0	−30	1
14	152	152	156	141	136	120	98	81	0	122.2	7.0	3.7	NE	0	0	−30	0
15	141	160	163	•141	131	152	131	125	1	118.3	4.4	1.2	N	1	0	−32	0
16	109	123	123	98	101	98	98	98	1	97.5	2.6	0.0	NE	10	0	−32	0
17	134	112	114	127	103	81	76	98	0	106.7	4.5	2.6	NE	10	5	−25	0
20	106	103	103	95	90	84	65	70	1	100.6	6.9	3.7	E	2	1	−29	1
21	98	92	92	98	106	109	99	104	0	88.8	3.7	1.3	E	2	0	−29	0
22	120	109	109	101	104	88	90	106	0	97.3	4.8	2.4	NE	1	0	−31	0
23	117	117	129	123	126	112	100	(97)]	1	132.8	5.3	1.8	E	2	0	−29	1
24	131	134	114	114	97	97	92	85]	1	100.6	2.3	0.0	W	8	1	−30	0
26	272	221	170	•141	147	170	187	•159]	2	147.0	1.3	0.0	N	10	4	−32	0
27	130	118	113	110	102	104	85	82	1	107.2	2.2	0.0	S	10	3	−32	0
28	99	104	113	99	119	93	92	82	1	93.8	1.5	0.0	NE	10	2	−33	0
29	124	138	134	131	124	131	121	127	0	96.8	3.6	1.9	W	10	0	−31	0
30	124	127	124	121	116	107	90	88	0	106.7	2.8	1.3	SW	7	0	−34	0
31	116	113	127	122	116	107	110	96	0	107.9	3.5	1.2	W	3	1	−38	0
Mean	126.7	129.3	130.3	125.7	126.4	119.3	105.9	101.4		107.7							
1924											m/s	m/s				°C	
Feb 2	126	120	•112	112	112	101	78	•78	0	118.8	4.3	1.6	S	5	0	−41	0
3	90	(90)	(87)	•84	78	73	70	•67	0	78.5	3.5	0.0	SE	3	0	−42	0
4	140	134	138	135	135	124	(115)	(105)	0	103.7	4.1	1.7	SW	1	0	−40	0
6	143	146	152	157	157	140	134	124]	1	145.7	6.0	2.5	SW	1	0	−33	1
7	109	115	124	117	106	95	89	67	0	107.8	6.2	3.8	SW	1	0	−37	0
8	124	126	101	98	98	104	103	92]	1	106.9	7.2	1.9	W	10	0	−36	1
9	141	133	132	140	166	194	265	280]	1	141.2	8.2	0.0	SW	1	0	−39	1
12	81	79	102	95	110	116	96	88]	2	99.7	7.9	1.6	SW	10	10	−27	1
13	238	187	227	244	182	187	167	150]	2	157.0	7.2	0.0	NE	10	2	−33	1
14	159	182	176	184	176	266	255	141]	2	169.0	5.9	1.7	SW	1	0	−38	1
15	167	179	204	227	273	216	198	•306]	2	158.7	6.8	1.2	NE	10	1	−34	1
16	147	141	124	153	216	221	238	182]	2	214.6	8.6	4.2	N	10	4	−28	1
17	131	133	124	116	116	124	119	96]	1	120.9	5.6	1.2	SW	10	0	−31	1
18	176	181	176	170	162	153	159	131	0	138.7	5.7	0.0	NE	10	0	−28	0
19	113	107	118	122	138	107	88	79	1	115.3	1.3	0.0	E	2	0	−28	0
20	105	124	170	147	147	96	85	73	2	96.6	2.3	0.0	NW	10	0	−28	0
21	85	102	107	96	85	81	85	88	1	79.0	1.8	0.0	NW	2	0	−31	0
22	130	141	130	124	118	113	113	121	0	110.9	3.0	1.2	SW	7	0	−28	0
23	124	116	119	127	130	130	153	210	1	111.3	3.8	1.8	SW	7	1	−26	0
24	104	113	119	109	96	102	108	102	2	115.5	3.8	2.3	W	7	0	−32	0
25	193	216	290	255	278	290	300	278]	2	156.9	5.5	2.8	SW	10	2	−30	1
26	141	159	136	113	164	261	210	153]	2	148.7	6.6	3.8	SW	10	1	−28	1
27	108	121	96	85	90	90	113	96]	2	107.5	4.7	0.0	W	5	0	−37	1
28	164	127	119	113	110	107	113	107]	2	121.4	4.8	1.8	NE	2	0	−39	1
29	136	145	145	147	116	135	121	112	1	121.6	4.9	0.0	N	6	0	−41	0
Mean	119.8	124.0	128.3	124.0	118.6	109.2	105.3	102.8		108.2				.	.		

( ) = Interpolated. [ ] = Not used in the mean [a] Mist [b] Fog [c] Snow [d] Light snow [e] Haze.

(1) RELATIONS BETWEEN METEOROLOGICAL FACTORS AND ATMOSPHERIC-ELECTRIC POTENTIAL-GRADIENT

The meteorological relations studied include those concerned with snow-drift, charge on drift-snow, wind-direction, fog or haze, cloudiness, relative humidity, temperature, and meteorologically undisturbed days.

(a) *Potential gradient and snow-drift*—When observing the potential gradient in the Arctic on the *Maud* Expedition we found, as Simpson[6] found in the Antarctic, that as soon as the wind became strong enough to cause snow-drift the potential gradient became very high and positive. However, in contrast to Simpson, we observed a negative gradient only once, on November 5, 1924, from $10^h\,40^m$ to $11^h\,10^m$ G. M. T. The

[6] British Antarctic Expedition, 1910–1913, p 306.

TABLE 53—*Mean Hourly Values Centered on the Hour of Potential Gradient in Volts per Meter*

Day	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h
1924																
Mar 1	129	95	84	89	95	84	79	98	89	101	112	106	131	106	126	120
2	93	90	79	[d]79	73	79	73	73	76	73	84	90	99	113	116	118
3	[248	273	276	276	260	200	226	200	209	259	265	265	245	187	180	209
4	[95	85	79	93	85	81	90	107	107	118	132	203	248	288	277	259
5	[269	259	280	[d]274	214	164	187	159	195	234	288	203	147	135	(158)	158
6	[170	172	175	141	223	152	152	237	183	175	206	198	198	183	209	[d]191
7	[(107)	(102)	99	93	99	90	109	109	121	79	79	93	124	169	220	158
8	105	93	96	91	85	85	88	91	85	91	91	93	102	113	119	119
9	[107	90	93	202	198	124	93	170	150	119	175	177	210	278	283	283
10	[204	96	96	102	93	90	88	93	90	79	82	102	116	119	136	136
11	86	86	86	86	74	78	81	69	63	66	74	86	103	103	106	109
12	[95	93	93	107	110	117	118	120	137	143	121	138	151	146	160	173
13	113	90	79	96	111	109	113	143	143	143	158	143	158	163	123	128
14	77	77	87	92	95	87	85	85	87	85	96	107	121	124	127	109
15	[85	77	74	74	70	74	74	79	89	92	114	[c]104	127	139	154	[e]161
16	89	85	89	92	95	95	92	[e]89	89	95	92	104	90	89	117	[e]114
17	(88)	(91)	(93)	96	99	104	104	107	109	109	120	129	134	149	127	120
18	110	99	97	92	99	99	97	99	99	99	99	115	127	132	150	140
19	[93	90	100	90	98	100	102	98	98	100	90	106	129	145	158	175
20	[193	170	130	120	117	135	107	82	92	98	107	90	115	140	121	135
21	[104	99	104	102	97	99	104	117	89	89	94	112	121	139	139	141
23	[118	116	116	113	103	99	96	96	83	91	103	93	93	101	103	113
25	[(173)	(151)	124	[c]116	118	(124)	(118)	[e](116)	(111)	(106)	103	118	133	159	167	158
26	104	94	88	84	84	79	94	69	79	79	79	134	153	148	163	[d]158
27	129	124	134	129	141	137	134	139	145	149	166	170	172	174	170	172
28	135	110	118	115	113	110	110	118	120	135	151	163	166	166	180	160
29	[141	147	137	127	127	124	117	106	91	76	81	111	119	111	131	152
30	[177	152	(137)	(124)	(112)	(101)	(91)	81	81	83	86	101	124	141	149	127
31	81	(85)	(95)	110	110	110	116	106	103	100	90	85	116	120	126	131
Mean	103 0	94 5	94 2	96 2	98 0	95 8	97 4	98 9	99 0	101 9	108 6	117 3	129 3	130 8	134 4	130 6
1924																
Apr 1	[85	78	78	78	90	97	109	118	123	121	121	127	141	175	147	149
2	120	104	132	152	138	132	127	132	127	118	113	123	140	147	145	152
3	118	109	102	97	104	109	113	133	133	124	124	124	142	161	166	156
4	98	101	95	95	98	113	115	115	122	108	115	122	127	137	132	139
8	[134	124	152	150	143	143	143	148	126	129	141	152	152	157	157	157
9	[129	117	124	119	121	124	124	124	124	119	124	119	117	121	121	129
11	134	115	120	[c]115	115	110	106	108	110	110	139	141	134	144	153	[d]163
12	124	109	112	102	102	107	92	90	98	98	100	107	112	117	122	129
13	[113	101	94	101	119	99	104	101	101	128	128	124	156	148	173	[d]168
14	[127	113	138	143	163	182	152	[d]152	167	157	172	192	187	192	197	182
19	143	127	123	123	116	113	113	118	118	123	138	143	155	172	172	172
20	[127	103	101	99	108	123	113	103	138	133	136	133	143	157	143	138
21	113	108	103	110	108	88	103	108	101	113	127	138	148	197	189	184
22	138	133	133	110	108	103	101	113	133	143	145	138	157	163	182	177
23	108	103	96	88	84	88	103	113	123	110	103	110	113	123	120	156
24	123	132	123	123	123	132	135	135	140	142	152	160	172	180	182	187
25	127	112	102	122	136	102	120	127	136	176	151	185	191	198	200	198
26	150	135	128	138	124	121	113	96	82	87	96	106	119	145	163	160
27	131	121	124	117	117	128	131	119	106	111	111	117	128	145	152	156
28	96	89	96	106	89	74	94	96	101	113	96	78	104	120	120	[d]111
29	101	101	120	111	131	116	116	116	116	135	131	150	150	140	155	155
30	[124	116	106	102	106	116	106	138	135	131	140	159	138	131	126	126
Mean	121 6	113 3	113 9	113 9	112 9	109 1	112 1	114 6	116 4	120 8	122 8	129 4	139 4	152 6	156 9	159 7
1924																
May 1	198	205	201	201	198	203	205	198	205	205	164	135	139	139	143	156
2	106	102	96	90	98	94	94	106	110	94	102	117	135	137	135	135
3	94	98	61	53	61	41	49	70	123	94	184	[b]201	203	191	184	[b]172
4	124	95	82	[c]74	70	68	66	62	68	86	99	105	115	124	126	132
5	95	88	74	70	56	74	70	72	67	86	90	111	121	135	140	135

( ) = Interpolated   [ ] = Not used in the mean   [a] Mist   [b] Fog   [c] Snow   [d] Light Snow   [e] Haze

wind-velocity on this day had been very high between 0^h and 9^h G M T, accompanied by heavy drift and high positive potential-gradient, but when the gradient was reversed the wind was not very strong and the drift had almost ceased, but snow was falling The occurrence of a negative gradient during snowfall represents nothing unusual and, therefore, does not give rise to further discussion However, it is remarkable that

from Electrograms, October 1923 to April 1925 (Greenwich mean time)—Continued

Day	17^h	18^h	19^h	20^h	21^h	22^h	23^h	24^h	Electric character	Mean	Wind Max	Wind Min	Wind True direction	Clouds Max	Clouds Min	Temperature	Snow-drift
1924											m/s	m/s				°C	
Mar 1	118	123	126	103	84	89	113	95	1	104 0	1 0	0 0	SE	10	0	−39	0
2	118	124	124	141	146	141	163	136	1	104 2	3 8	0 0	S	7	0	−38	0
3	177	184	152	141	130	121	107	107]	2	204 0	6 6	3 6	SE	1	0	−40	1
4	226	269	288	^{d}298	265	254	243	^{b,d}271]	2	185 9	6 6	1 0	N	10	3	−34	1
5	152	163	152	180	158	147	175	237]	2	195 3	7 8	2 0	N	10	3	−29	1
6	191	198	191	^{d}175	158	135	(122)	(113)]	2	177 0	4 7	1 6	N	10	10	−27	1
7	169	152	146	158	135	130	141	117]	2	125 0	5 6	0 0	SW	10	0	−30	1
8	122	131	136	136	133	105	102	141	0	106 4	5 5	1 3	S	0	0	−33	0
9	273	273	249	159	278	255	202	232]	2	194 7	8 4	4 9	SE	9	0	−30	1
10	124	119	119	122	102	90	98	98]	1	108 1	6 2	0 0	S	5	0	−31	1
11	103	(109)	(109)	109	98	95	104	93	0	90 7	1 9	0 0	SW	0	0	−32	0
12	141	135	135	^{c}120	126	160	183	^{c}109]	1	130 5	3 2	0 9	S	2	0	−32	1
13	120	103	88	103	96	99	99	92	1	117 6	4 8	1 7	SW	7	0	−30	0
14	112	102	102	99	95	97	106	92	0	97 8	4 8	1 9	SW	0	0	−31	0
15	190	137	(132)	(128)	(124)	(120)	104	92]	2	108 9	2 2	0 0	SW	3	0	−31	2
16	120	134	124	107	99	87	(87)	(87)	2	98 8	4 1	1 9	S	10	3	−31	0
17	109	121	121	139	141	137	140	132	0	117 5	4 5	0 0	SE	7	1	−33	0
18	150	148	140	^{c}137	127	115	120	102	0	116 3	4 5	2 2	E	8	3	−33	0
19	206	292	266	297	282	287	265	220	2	162 0	6 0	3 0	NE	10	1	−31	1
20	115	92	110	124	140	124	121	107]	2	120 2	6 8	0 0	E	10	2	−26	1
21	139	139	152	195	164	146	175	158]	1	125 8	5 0	2 9	SE	1	0	−33	1
23	121	128	143	135	158	187	(160)	^{c}(140)]	1	117 0	3 5	0 0	S	2	0	−31	3
25	156	148	145	138	138	128	117	111]	1	132 3	3 8	0 0	W	8	0	−28	0
26	163	173	183	178	158	144	145	132	1	123 5	0 0	0 0	—	8	0	−28	0
27	174	164	164	154	156	159	151	143	0	152 1	3 1	0 0	SW	3	0	−30	0
28	135	141	120	110	125	120	134	152	0	133 6	3 0	0 0	W	1	0	−28	0
29	167	137	177	^{c}167	172	192	155	155]	2	134 2	1 9	0 0	NE	1	0	−27	4
30	121	155	137	141	137	117	78	81]	2	118 1	4 1	0 0	NE	2	0	−29	0
31	123	126	120	108	93	88	90	90	2	105 1	4 8	3 0	E	10	0	−28	0
Mean	128 2	130 7	127 5	124 9	119 3	113 5	119 5	114 4		112 9							
1924																	
Apr 1	175	(161)	(156)	(152)	(145)	(138)	147	149]	1	127 5	6 7	3 2	E	4	0	−28	1
2	154	159	149	145	138	120	127	127	1	134 2	4 1	0 0	SE	7	0	−28	0
3	147	120	124	128	128	109	106	106	1	124 3	3 0	0 0	S	2	0	−26	0
4	139	134	132	(117)	95	95	100	98	1	114 2	4 4	0 0	SE	5	1	−26	0
8	150	150	145	145	143	134	138	134]	1	143 6	7 4	5 4	E	0	0	−26	1
9	134	129	119	117	114	105	106	120]	0	120 8	7 5	5 5	E	1	0	−27	1
11	151	148	151	141	137	139	131	117	1	130 5	5 3	2 4	SE	10	1	−24	0
12	137	132	124	120	120	122	118	124	0	113 3	3 0	0 6	E	10	0	−23	0
13	168	153	163	178	171	173	172	163]	2	137 5	5 6	2 6	E	10	4	−21	1
14	177	180	172	165	145	143	128	125]	2	160 5	6 2	5 1	E	10	0	−21	1
19	172	177	184	177	163	155	148	152	1	145 7	5 5	2 8	N	6	6	−23	0
20	143	167	163	165	198	143	113	118]	2	133 7	6 0	1 5	NW	7	0	−21	1
21	184	182	189	195	195	177	135	123	1	142 4	3 8	0 0	NW	0	0	−21	0
22	167	163	160	152	148	140	120	116	1	139 3	1 7	0 0	N	0	0	−19	0
23	158	156	163	158	148	140	140	138	1	122 9	5 0	0 0	E	9	0	−22	0
24	184	172	163	216	191	167	151	146	2	155 5	4 2	0 0	E	1	0	−24	0
25	222	200	191	187	171	158	143	135	2	157 9	1 8	0 0	W	2	0	−22	0
26	167	167	170	150	150	138	152	156	0	133 9	4 1	2 2	SW	1	0	−21	0
27	156	158	143	131	131	135	124	106	0	129 1	5 4	1 5	SW	2	0	−21	0
28	106	106	111	155	133	118	124	^{d}96	2	105 5	3 0	0 0	SW	10	2	−18	0
29	155	159	164	140	135	140	140	131	2	133 7	4 4	0 0	NE	10	10	−18	0
30	150	172	174	164	159	159	148	179]	2	137 7	6 3	3 8	NW	10	0	−18	1
Mean	159 9	155 5	154 5	154 1	145 5	136 9	130 6	124 7		132 1							
1924																	
May 1	148	156	156	156	148	139	121	117	2	168 2	11 9	6 7	W	8	1	−16	1
2	139	131	131	129	123	119	115	110	1	114 5	7 3	0 0	W	8	1	−17	0
3	160	156	148	^{b}148	156	172	165	140	2	130 2	3 6	0 0	NE	10	5	−17	0
4	140	156	148	142	132	115	113	111	0	106 4	4 9	3 0	NE	8	1	−15	0
5	144	106	134	125	117	107	104	102	2	101 0	6 4	2 5	NE	10	1	−13	0

( ) = Interpolated [ ] = Not used in the mean ^{a} Mist ^{b} Fog ^{c} Snow ^{d} Light snow ^{e} Haze

this case was the only one in which a negative gradient was observed. With the exception of this single case we found that snow-drift always was accompanied by high, positive potential-gradient

We have not a very great number of observations of the potential during strong winds, because the potential invariably increased beyond the range of the electrometer.

TABLE 53—*Mean Hourly Values Centered on the Hour of Potential Gradient in Volts per Meetr*

Day	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h
1924																
Nov 1	[41	41	37	40	114	134	114	69	59	57	62	69	69	79	59	69
2	[60	(59)	(59)	(59)	59	60	62	65	71	65	76	89	93	93	83	89
4	[138	97	100	98	83	90	97	97	95	93	93	90	90	100	104	128
5	[180	93	100	169	193	210	172	131	104	86	[d,g]69	169	104	83	55	55
6	[67	93	152	190	225	225	225	172	34	38	66	69	34	36	36	41
7	72	76	74	96	100	59	45	38	45	59	65	69	65	69	69	79
8	[73	97	100	89	67	62	69	157	160	79	79	99	115	145	132	132
9	[86	79	77	86	91	91	70	79	82	84	89	86	77	65	86	92
10	97	101	105	88	90	95	103	101	98	98	109	109	105	109	109	109
11	70	66	64	74	80	76	78	78	73	74	82	82	82	85	88	85
12	(73)	73	65	58	58	61	61	51	58	65	70	70	75	72	82	87
13	77	84	89	91	101	101	98	82	79	80	84	91	92	112	119	129
17	72	74	63	74	59	63	67	67	70	68	68	76	91	89	98	122
18	[62	59	52	56	62	70	74	70	61	59	61	70	64	76	80	74
19	[167	156	102	86	109	86	76	80	73	86	90	85	82	80	80	85
20	61	52	59	59	59	67	62	58	58	59	62	62	62	62	66	66
21	45	(45)	45	45	55	59	62	61	66	62	71	70	82	73	83	90
22	67	64	75	75	79	99	75	79	72	75	82	75	79	103	91	97
23	95	70	60	58	58	72	74	80	67	55	52	67	77	72	65	67
25	57	53	53	50	52	57	64	70	70	72	75	87	87	87	89	95
26	[53	52	52	53	59	67	84	87	90	107	[e]167	106	191	191	200	207
27	[85	70	91	117	83	85	95	80	67	87	92	107	167	134	191	197
Mean	71 4	68 8	68 3	69 8	71 9	73 6	72 6	70 4	68 7	69 7	74 6	78 0	81 6	84 8	86 8	93 3
1924																
Dec 3	79	73	73	83	74	64	64	64	70	66	[e]72	86	98	102	106	106
4	89	86	79	76	83	86	96	91	94	79	[d]81	91	106	121	121	128
5	88	88	68	76	86	76	74	76	76	95	[d]99	114	108	118	125	122
8	97	99	88	86	74	73	73	86	76	70	73	86	95	97	94	90
12	[110	103	67	58	62	73	124	86	73	65	58	64	67	77	80	80
13	[71	71	73	66	68	62	[d]58	83	161	120	113	154	109	100	[d]82	73
14	73	60	60	68	68	71	75	83	83	98	109	94	107	110	115	118
17	88	105	100	105	109	91	80	88	85	76	97	88	89	91	91	110
18	112	116	124	106	95	89	97	101	104	106	[d]120	127	110	147	[d]124	135
19	94	96	73	69	71	85	[d]104	77	79	104	[d]107	90	104	107	123	119
20	82	82	78	78	76	80	82	82	78	82	89	97	99	101	109	109
22	[64	58	70	74	64	55	56	74	70	74	70	70	124	191	178	187
23	[66	66	70	62	58	70	70	62	58	58	58	71	67	79	73	73
24	[147	(118)	98	85	82	76	79	85	83	82	87	110	107	110	107	103
25	[134	134	122	132	134	118	92	97	92	100	92	84	92	109	122	110
26	[76	82	94	73	71	80	[e]90	76	76	68	73	92	95	92	100	100
Mean	89 1	89 4	82 6	83 0	81 8	79 4	82 8	83 1	82 8	86 2	94 1	97 0	101 8	110 4	112 0	115 2
1925																
Jan 5	[(64)	59	64	67	67	57	53	47	23	33	76	119	137	137	125	115
10	118	163	106	114	131	141	136	124	141	145	176	169	159	157	165	165
13	[224	139	[a]97	101	120	163	116	116	116	114	114	124	136	122	131	131
14	98	85	85	85	100	104	101	114	124	124	100	100	116	124	112	127
17	81	81	82	70	71	68	68	77	54	54	66	70	77	79	93	(104)
18	57	59	55	51	55	51	49	47	39	41	39	51	51	53	53	(57)
20	58	50	54	56	58	58	60	62	56	54	58	62	65	70	74	72
21	60	56	62	66	64	60	54	52	50	38	52	62	66	72	85	108
22	[179	203	[a]207	191	211	163	[d]169	124	80	64	64	73	78	82	[d]86	88
23	102	82	73	73	70	73	70	63	61	59	53	57	57	83	83	90
25	67	64	[d]58	59	56	67	[d]72	72	67	67	79	91	100	103	112	107
26	78	74	71	73	65	62	71	71	62	67	65	71	59	62	74	80
27	53	49	59	59	55	63	63	71	57	67	75	91	96	103	98	104
29	61	55	43	49	52	52	61	53	63	63	63	65	71	77	83	89
30	55	53	67	67	100	91	104	98	94	92	92	110	108	94	98	118
Mean	70 0	64 4	64 4	64 4	67 8	68 1	70 3	70 9	66 1	66 0	67 4	75 4	78 7	82 7	87 7	96 0

( ) = Interpolated [ ] = Not used in mean. [a] Mist [b] Fog [c] Snow [d] Light snow [e] Haze [g] There was negative potential-gradient between $10^h\,40^m$ and $11^h\,10^m$.

Grouping the potential gradients according to the velocity of the wind, we find from the eye-observations, 1922 to 1923:

Wind-velocity, meters per second	0–1 0	1 1–2 0	2 1–3 0	3 1–4 0	4 1–5 0	5 1–6 0	6 1–7 0	7 1–8 0
Potential gradient, volts per meter	118	126	114	110	110	124	134	149
Number of observations	16	30	33	28	22	10	12	8

It does not seem necessary to undertake a corresponding grouping for the two periods from which continuous records are available, because the relation between wind

from Electrograms, October 1923 to April 1925 (Greenwich mean time)—Continued

Day	17h	18h	19h	20h	21h	22h	23h	24h	Electric character	Mean	Wind Max.	Wind Min.	Wind True direction	Clouds Max	Clouds Min	Temperature	Snowdrift
1924											m/s	m/s				°C	
Nov 1	52	127	76	79	83	72	59	59]	2	71 7	5 7	1 0	SW	10	1	−18	1
2	97	91	76	73	76	89	[d]83	98]	0	76 0	5 6	1 2	E	10	0	−23	1
4	141	158	(150)	(140)	128	173	166	190]	2	118 3	8 6	1 2	W	9	0	−22	1
5	38	50	66	55	83	86	[d]69	66]	2	103 6	14 1	1 9	SE	10	2	− 7	1
6	46	48	62	69	57	69	62	66]	2	90 9	12 9	1 8	SW	10	0	−17	1
7	81	86	86	86	83	59	69	76	2	71 1	3 0	0 0	W	10	2	−20	0
8	136	149	158	116	119	96	[d]89	75]	2	108 0	7 6	1 7	SW	10	2	−18	1
9	109	119	127	130	113	103	97	95]	1	92 2	5 5	2 4	W	10	2	−16	1
10	110	109	115	115	105	98	80	80	1	101 6	4 4	3 0	W	9	1	−21	0
11	76	88	82	78	78	74	76	(73)	1	77 6	3 7	0 0	W	10	1	−19	0
12	101	116	110	107	99	75	80	77	1	76 8	3 2	0 0	NE	10	10	−17	0
13	152	151	154	152	148	133	122	109	1	109 6	4 1	1 7	E	10	2	−20	0
17	115	107	105	118	88	86	66	52	2	81 6	2 3	0 0	NE	10	3	−22	0
18	74	90	85	94	135	170	177	173]	2	85 3	5 3	0 0	SW	10	3	−25	1
19	92	73	80	80	62	57	62	59]	2	87 0	5 7	1 9	SW	10	1	−27	1
20	73	85	80	62	52	43	43	43	1	60 6	2 6	0 0	SW	4	0	−31	0
21	96	96	96	96	86	82	70	72	0	71 2	1 3	0 0	SE	4	0	−33	0
22	106	116	[d]137	143	137	96	60	73	1	89 8	4 0	0 0	W	10	3	−30	0
23	77	74	65	60	55	50	74	70	1	67 2	3 4	1 0	SW	8	2	−34	0
25	90	100	83	75	77	62	(57)	53	1	71 5	3 4	0 7	SW	1	0	−37	0
26	177	227	[c]214	200	197	194	181	121]	2	136 5	4 5	1 1	E	9	1	−33	0
27	204	204	144	121	107	85	87	77]	2	115 7	5 0	2 0	NE	10	8	−25	1
Mean	97 9	102 6	101 2	99 3	91 6	78 0	72 4	70 7		79 9							.
1924																	
Dec 3	107	106	111	109	91	91	87	77	1	85 8	6 1	1 0	SW	10	3	−10	0
4	136	138	132	128	116	109	[d]112	101	1	103 3	4 5	0 0	SW	10	0	−21	0
5	106	103	88	103	121	106	[d]76	83	2	94 8	3 4	0 0	NW	10	10	−20	0
8	94	90	[c]105	90	101	86	[c]67	65	2	85 6	2 6	0 0	E, SW	10	5	−25	0
12	80	71	[d]67	75	71	67	60	64]	2	75 1	6 1	0 6	SW	10	2	−24	1
13	75	73	83	90	90	83	96	86]	2	89 2	4 5	1 3	W	10	2	−26	1
14	105	100	113	109	100	100	90	90	0	91 6	3 1	0 0	SE	1	0	−33	0
17	109	113	[d]110	101	97	94	85	81	1	95 1	4 3	0 0	W	10	10	−24	0
18	163	163	170	(158)	(143)	(124)	[d]107	94	2	122 2	4 0	0 0	SE	10	10	−21	0
19	112	100	96	107	104	106	101	88	1	96 5	5 9	0 6	W	10	4	−24	0
20	101	109	[c]113	109	94	82	[c]97	83	1	91 3	4 0	0 0	N	10	6	−24	0
22	183	187	167	144	140	148	116	77]	2	110 0	8 6	0 0	NE	10	0	−18	1
23	89	70	70	81	104	116	151	132]	1	78 1	5 9	1 1	SW	10	2	−12	1
24	104	110	110	97	112	131	[d]134	145]	1	104 2	5 4	0 0	N	10	2	−24	1
25	97	95	86	84	88	69	73	63]	1	100 8	5 3	0 0	NE	10	0	−20	1
26	88	92	95	97	92	113	[d]95	119]	1	88 7	4 4	0 6	W	10	0	−24	1
Mean	114 8	113 6	115 3	112 7	107 4	99 8	91 3	84 7		96 3							
1925																	
Jan 5	129	125	[d]141	123	123	119	(110)	(100)]	1	92 2	7 6	4 1	SW	10	10	−16	1
10	173	157	153	145	137	124	114	90]	2	141 8	5 4	1 7	W	10	7	−31	1
13	120	109	101	95	100	118	102	116]	2	121 9	5 6	0 9	SW	10	1	−30	1
14	154	135	130	151	151	143	119	104	2	116 1	2 9	0 9	W	10	1	−31	0
17	(112)	(116)	112	108	97	91	70	67	1	82 0	3 4	0 9	SE	2	0	−37	0
18	(62)	62	59	55	55	47	55	62	1	52 7	3 6	0 0	S	2	1	−36	0
20	70	68	66	62	(58)	55	54	54	0	60 6	3 4	0 9	SW	2	0	−34	0
21	124	124	114	116	108	91	95	124	1	79 3	3 0	0 0	S	4	0	−35	0
22	84	124	128	128	167	96	102	146]	2	126 5	5 4	0 0	S	10	2	−29	1
23	98	102	98	98	98	94	85	79	1	79 2	3 8	0 0	W	10	0	−36	0
25	113	103	103	103	97	91	90	86	1	84 5[g]	4 1	1 1	E	10	0	−26	0
26	71	74	67	78	82	71	55	51	1	68 9	2 9	0 7	SE	10	0	−24	0
27	103	103	115	110	91	83	63	53	0	78 5	2 3	0 0	NE	10	10	−23	0
29	93	103	93	87	91	79	73	55	0	69 8	3 6	1 1	SW	10	1	−30	0
30	130	130	98	106	91	79	63	57	1	91 5	4 0	0 0	NW	10	3	−27	0
Mean	102 7	101 8	95 9	97 6	92 6	84 0	74 7	72 0		78 4				.		. .	

() = Interpolated [ ] = Not used in mean [a] Mist [b] Fog [c] Snow [d] Light snow [e] Haze [g] There was negative potential-gradient between $10^h\,40^m$ and $11^h\,10^m$

and gradient can be brought out clearly enough by grouping the mean potential-gradient of the day according to the maximum hourly wind-velocity during the day. We find:

Maximum wind-velocity, meters per second		0–1 0	1 1–2 0	2 1–3 0	3 1–4 0	4 1–5 0	5 1–6 0	6 1–7 0	Greater than 7 0
1923–24	Potential gradient, v/m	114	117	110	112	119	134	131	140
	Number of cases	2	9	24	21	42	20	19	18
1924–25	Potential gradient, v/m		86	86	90	104	128	80	111
	Number of cases	0	5	15	22	20	9	2	8

no correlation between this and the potential gradient, which plainly shows the typical diurnal-variation, which will be discussed later Numerous examples of the types here described can be found among the records We find, however, that the critical limit of the wind-velocity is subject to great variations, especially in the fall and the spring, when a higher wind-velocity is required to cause snow-drift than in winter. This can be explained easily by the conditions of the surface in the various seasons In the fall the surface is formed by coarse snow or frost crystals and in the spring it is hardened under the action of the Sun, but in winter it is frequently covered by very light snow or frost crystals, which are whirled up by a very moderate wind But even in winter the surface is constantly changing, and we may find, therefore, that on one day a wind of a velocity of 4.5 meters per second is accompanied by drift, while on another the velocity may increase to 6 0 meters per second without causing drift We also find that the drift generally continues until the wind-velocity is smaller than it was when the drift began

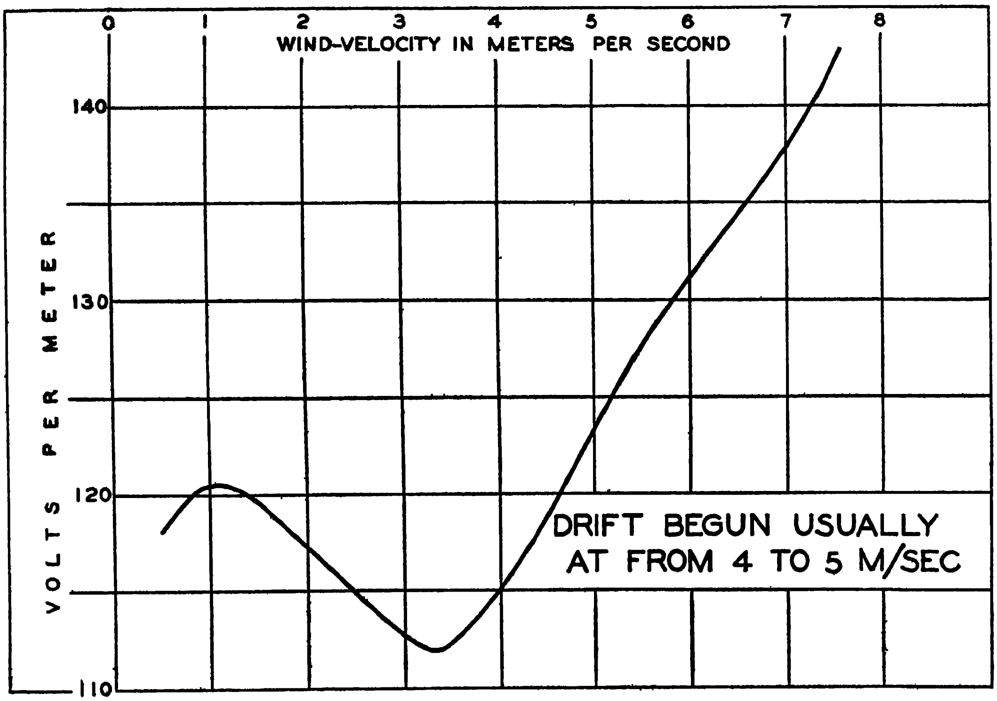


FIG 30—Snow-drift and atmospheric potential-gradient, *Maud* results, winters 1922-24
[Smoothed means — $(a + 2b + c)/4$]

(*b*) *Sign of the charge of the drift-snow*—Discussing the cause of the high potential-gradients which are found during snow-drift, Simpson arrives at the conclusion that (1) "the electricity which affects the recorded potential-gradient during drift is not associated with the driven snow, but (2) with the air above the drift, and (3) the separation of electricity takes place when ice-crystals collide, the ice becoming negatively charged and the air positively charged"

Simpson assumes that the positive charge of the air is carried to considerable altitudes by the irregular (turbulent) movement of the air, thus producing a positive space-charge above the collector and strengthening the normal electric field Occasionally the eddy-motion may be so small that the major part of the positive charge remains below the collector, and in this case the normal electric field may become reversed close to the surface This assumption serves to explain an interesting case in which negative gradient was observed.

VIEWS ON THE "MAUD" EXPEDITION

1 Ice-crack through Observatory
4 Ice near vessel, June 1924
7 Observing atmospheric potential-gradient

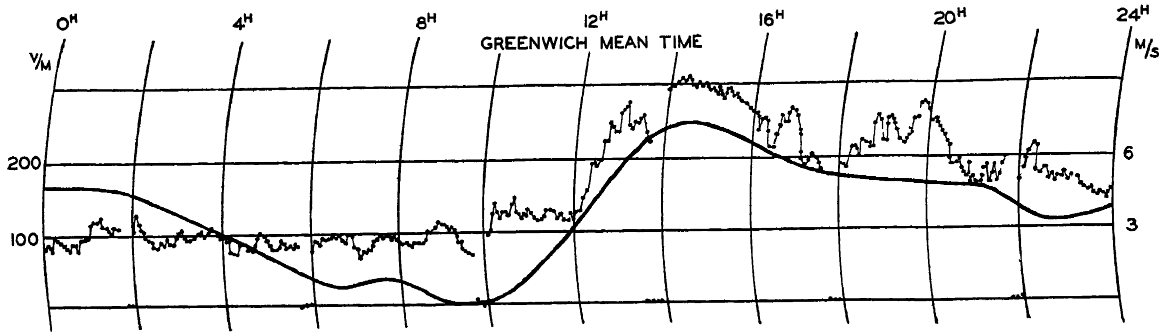
2 Atmospheric-electric station on ice
5 Personnel of the *Maud* Expedition during 1922 to 1925 (Dahl, Malmgren, Wisting Sverdrup, Olonkin, Hansen, Kakot)
8 Recording electrometer and housing, showing frost conditions

3 Potential-gradient collector and "solar observatory"
6 Declinograph and housing
9 Electrometer and tripod

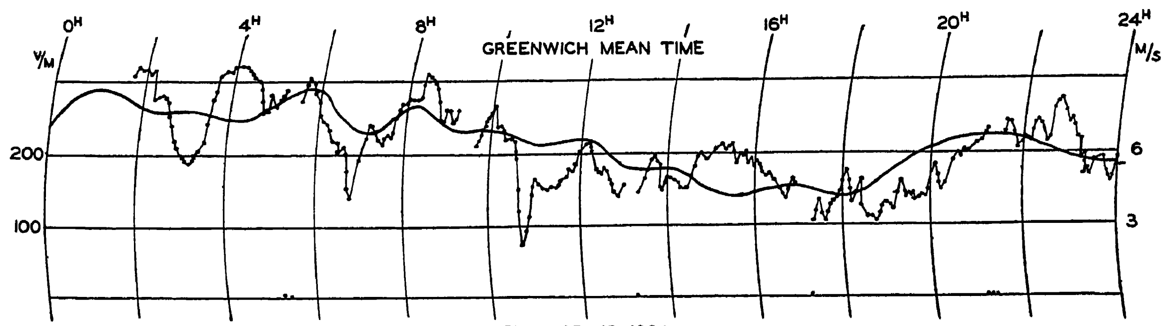
TABLE 54——*Mean Hourly Values on the Hour, Greenwich Mean Time, of the Diurnal Inequality of the Potential Gradient in Volts Per Meter*

Month or period	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h
1922–1923													
October–April	−11 6	−16 9	−17 1	−19 8	−15 5	−21 6	−19 7	−18 7	−16 7	−15 0	−11 0	− 2 5	+ 6 9
1923													
October	− 8 6	− 6 4	− 9 8	−12 9	−10 6	− 9 1	−11 3	−14 3	−13 4	−13 8	−13 6	− 7 4	+ 3 2
November	−13 8	−18 1	−22 7	−23 7	−21 5	−15 0	−16 6	−19 9	−18 9	−17 3	−14 7	− 4 1	+10 2
December	−17 0	−17 5	−16 3	−13 8	−12 5	− 9 4	− 6 4	− 6 2	− 9 6	−11 5	− 9 1	− 5 7	+ 1 0
1924													
January	−12 6	−18 5	−21 7	−24 6	−25 8	−21 0	−15 8	−12 2	−11 0	− 9 6	− 6 3	+ 5 4	+13 6
February	− 8 9	− 7 1	− 7 8	− 9 7	−10 2	− 6 2	− 7 7	− 3 8	− 8 9	− 8 4	− 4 5	− 5 2	− 4 8
March	− 9 8	−18 3	−18 6	−16 6	−14 8	−17 0	−15 3	−13 9	−13 8	−10 9	− 4 2	+ 4 5	+16 5
April	−10 5	−18 8	−18 2	−18 2	−19 2	−23 0	−20 0	−17 5	−15 8	−11 3	− 9 3	− 2 7	+ 7 3
1923–1924													
November–January	−14 4	−18 0	−20 0	−20 4	−19 9	−15 2	−12 8	−12 2	−12 6	−12 4	− 9 6	− 1 1	+ 8 3
1924													
February–April	− 9 9	−15 2	−15 3	−15 2	−15 1	−15 8	−14 9	−12 3	−13 1	−10 4	− 6 3	− 1 1	+ 6 8
1923–1924													
October–April	−11 8	−15 4	−16 7	−17 2	−16 7	−14 8	−13 6	−12 5	−13 0	−11 7	− 8 6	− 1 9	+ 7 0
1924													
November	− 8 5	−11 1	−11 6	−10 1	− 8 0	− 6 3	− 7 3	− 9 5	−11 2	−10 2	− 5 3	− 1 9	+ 1 7
December	− 7 2	− 6 9	−13 7	−13 3	−14 5	−16 9	−13 5	−13 2	−13 5	−10 1	− 2 2	+ 0 7	+ 5 5
1925													
January	− 8 4	−14 4	−14 4	−14 4	−10 6	−10 3	− 8 1	− 7.5	−12 3	−12 4	−11 0	− 3 0	+ 0 3
February	− 8 1	−12 1	−14 2	− 9 6	− 5 6	− 4 6	− 4 5	− 6 4	− 8 2	− 9 1	− 7 8	− 0 9	+ 2 4
March	− 9 9	−18 2	−16 5	−20 8	−18 8	−23 1	−20 0	−12 0	−11 2	− 6 3	− 5 8	+ 1 4	+10 5
April	−19 0	−23 3	−22 3	−26 3	−31 0	−28 1	−24 7	−29 8	−21 1	−19 3	−10 7	+ 4 4	+14 0
1924–1925													
November–January	− 8 0	−10 9	−13 0	−12 4	−10 8	−10 8	− 9 4	− 9 8	−12 2	−10 9	− 6 4	− 1 5	+ 2 3
1925													
February–April	−11 6	−17 3	−17 2	−17 8	−17 2	−17 6	−15 3	−14 7	−12 8	−10 8	− 7 8	+ 1 3	+ 8 5
1924–1925													
November–April	− 9 8	−14 1	−15 1	−15 1	−14 0	−14 2	−12 3	−12 3	−12 5	−10 9	− 7 1	− 0 1	+ 5 3

Month or period	14h	15h	16h	17h	18h	19h	20h	21h	22h	23h	24h	Mean value of potential gradient	Number of days
1922–1923													
October–April	+15 0	+20 8	+26 3	+27 8	+22 9	+25 4	+26 1	+15 7	+ 6 2	+ 1 2	− 6 9	108 1	13
1923													
October	+16 1	+14 5	+17 9	+17 9	+23 5	+21 2	+20 6	+11 7	+ 0 7	− 7 8	− 8 9	113 7	11
November	+17 0	+21 3	+25 5	+29 5	+29 2	+30 7	+31 3	+15 2	+ 4 9	+ 1 1	−10 2	95 9	11
December	+ 6 6	+ 9 0	+12 3	+21 0	+22 8	+22 6	+21 9	+12 3	+ 6 3	+ 0 3	− 1 4	119 1	14
1924													
January	+13 5	+22 0	+20 6	+19 0	+21 6	+22 6	+17 4	+18 7	+11 6	− 1 8	− 6 3	107.7	15
February	+ 4 9	+ 7 8	+13 8	+11 7	+15 9	+20 2	+15.9	+10 5	+ 1.1	− 2 8	− 5 3	108.1	12
March	+18 0	+21 4	+17 6	+15 4	+17 9	+14 7	+12 1	+ 6 5	+ 0 7	+ 6 7	+ 1.6	112.8	13
April	+20 5	+24 8	+27 6	+27 8	+23 4	+22 4	+22.0	+13 4	+ 4 7	− 1 5	− 7 4	132 1	15
1923–1924													
November–January	+12 1	+16 8	+19 0	+22 6	+24 2	+24 9	+22 8	+15 6	+ 8 0	− 0 2	− 5 3	108 4	40
1924													
February–April	+14 9	+18 7	+20 2	+18 9	+19 3	+19 2	+16 9	+10 2	+ 2 3	+ 0 7	− 3 9	118 7	40
1923–1924													
October–April	+13 8	+17 3	+19 4	+20 4	+21 9	+21 9	+19 9	+12 7	+ 4 6	− 0 7	− 5 2	113 6	91
1924													
November	+ 4 9	+ 6 9	+13 4	+18 0	+22 7	+21 3	+19 4	+11 7	− 1 9	− 7 5	− 9 2	79.9	11
December	+14 1	+15 7	+18 9	+18 5	+17 3	+19 0	+16 4	+11 1	+ 3 5	− 5 0	−11 6	96 3	9
1925													
January	+ 4 3	+ 9 3	+17 6	+24 3	+23 4	+17 5	+19 2	+14 2	+ 5 6	− 3 7	− 6 4	78 4	11
February	+10 4	+ 7 9	+10 7	+14 6	+17 6	+21 1	+18 3	+ 9 4	+ 1 3	−12 9	− 8 1	94 5	11
March	+12 5	+14 3	+14 7	+17 1	+18 4	+16 0	+20 2	+17 7	+ 9 7	+ 6 4	+ 2 7	103 6	11
April	+22 8	+27 9	+33 7	+28 7	+30 3	+32 3	+24 2	+25 7	+15 0	+ 3 7	− 7 3	105 2	8
1924–1925													
November–January	+ 7 7	+10 4	+16 5	+20 4	+21 4	+19 3	+18 5	+12 5	+ 2 4	− 5 4	− 8 9	84 1	31
1925													
February–April	+14 0	+15 5	+18 2	+19 3	+21 3	+22 2	+20 6	+16 8	+ 7 1	− 1 4	− 4 0	100 7	30
1924–1925													
November–April	+10 8	+12 8	+17 3	+19 8	+21 3	+20 7	+19 5	+14 6	+ 4 6	− 3 4	− 6 5	92 3	61



FEBRUARY 13, 1924



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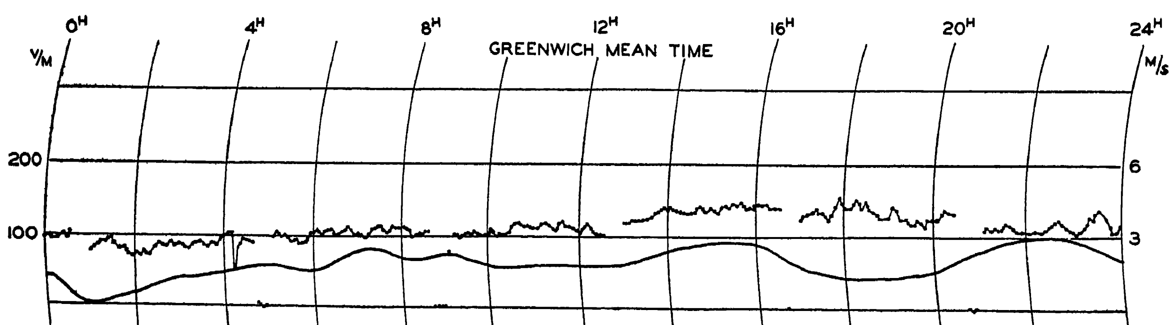

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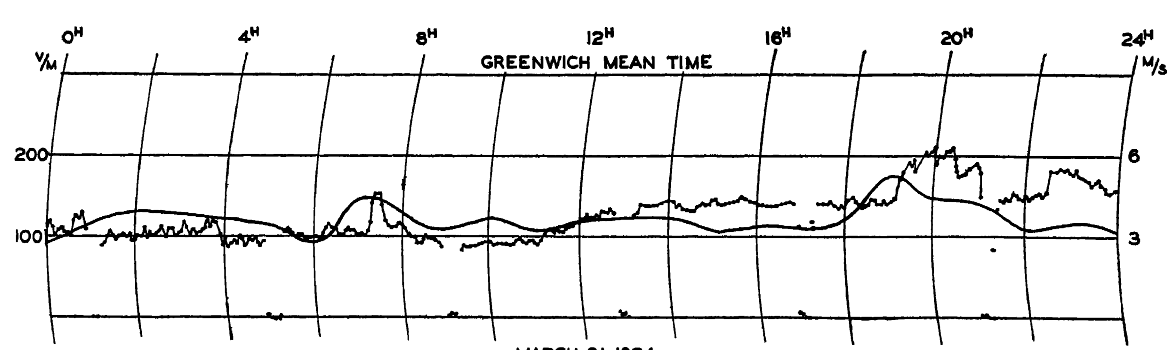


MARCH 21, 1924

FIGS 31 to 34—Atmospheric potential-gradient and wind-velocity records for Greenwich days, February 13, 16, 22, and March 21, 1924

It may here be noted that we never observed negative gradients during drift, though the drift often was far below the collector, which during the winters of 1923–24 and 1924–25 was 6 meters above the ice This can be explained, assuming Simpson's theory to be correct, by the fact that the movement of the air was very irregular on account of the roughness of the ice, so that the positive charges were always carried to considerable altitudes

Regarding his results, Simpson says "These conclusions are based entirely on the observed potential-gradients, and it is obvious that the only satisfactory test would be to examine the sign of the charge of the drift-snow itself. If this were found to be negative the conclusion would be proved beyond doubt. It is to be hoped that the simple experiment will be carried out by the first observer who has the opportunity"

A. Staeger has investigated the sign of the charge on snow-crystals In his first paper[7] he concludes that in snow-drift the large particles become negatively charged and the very small particles become positively charged, and states that his results are in agreement with Simpson's conception if Simpson's terms "ice-crystals" and "air" are replaced by "large" and "small" particles However, in his second paper, Staeger[8] concludes that "the negative charges are bound to the small, light, floating snow-particles, while the positive are bound to the heavier." Considering these contradicting results further investigation seems desirable.

On board the *Maud*, F. Malmgren and the writer carried out an experiment in order to determine the sign of charge of the snow The result of this experiment can not be regarded as conclusive evidence for the correctness of Dr. Simpson's conception, but undoubtedly substantiates his view. Before describing the experiment a few experiences will be mentioned which are of interest in this connection.

We found that the wireless antenna always became charged with electricity when the snow-drift was so high that it passed over the masts of the ship. In the wireless room it was possible to draw long sparks from the connection to the antenna. The phenomenon was observed in winter only when the insulation of the antenna was very good Examining the sign of the charge, it was found to be negative. The collector-post was found to be charged in a similar way. In a few cases when the drift was so high that it was well above the collector, the collector was removed. As long as the collector was in place the electrometer recorded a high positive potential, but as soon as it was removed the system became charged with negative electricity. These observations can be explained in two ways: (1) the negative charge of the drift-snow is deposited on the isolated antenna or collector-post, or (2) by the collision of the drift-snow with antenna or collector-post electricity becomes so separated that the negative charge remains on the antenna or collector-post while the positive charge remains on the snow.

The first explanation is in agreement with Simpson's conception, but according to Staeger the second explanation is correct. These experiences, therefore, can give no information as to the sign of the charge of the snow. In order to determine this, it would be necessary to place an insulated vessel or tray so that the drift-snow would accumulate on it, and examine the sign of the potential to which it might be charged It is a common experience that, wherever a cavity is formed in a bank of drift-snow, this cavity will be filled very rapidly. We took advantage of this fact to perform an experiment, the arrangement for which is shown in Figure 35, in which S represents a cut through a snow-bank, which was 110 cm. high and had been formed 3 meters from the side of the ship, on the southwest side. At the edge of the snow-bank a cavity, C, was formed and a wall-insulator, I, consisting of a brass rod inside a wooden protection and insulated with sulphur and hard rubber, was so placed that it extended from this cavity

[7] Experimentaluntersuchungen über Kontaktelektrisierung u s w *Ann Physik*, vol. 76 (1925), pp 49–70

[8] Weitere Untersuchungen über Kontaktelektrisierung u s w *Ann Physik*, vol 77 (1925), pp 225–240.

to the level ground below The upper end of the wall-insulator was protected from the drift-snow by baffle-caps, but the lower end was unprotected, because the air here was free of drift-snow The brass rod of the wall-insulator carried a tray T at the upper end and to the lower end the electrometer E was connected.

The experiment was undertaken on January 9, 1925, when a fresh southwest wind, accompanied by dense but low drift was blowing The drift-snow began immediately to accumulate in the cavity and on the tray. Watching the accumulation, it looked as if by far the greater amount of snow which struck the tray actually remained there, but a small amount was blown off. During this process the potential of the electrometer increased in steps corresponding to gusts of wind which brought a greater or smaller amount of snow down on the tray The increase was independent of whether the tray was covered with snow or not. In a few minutes the potential was on the point of exceeding the maximum scale-value, 200 volts Disconnecting the electrometer, the sign of the charge was found to be negative The experiment was repeated several times during half an hour and always with the same result, which points strongly to the conclusion that the snow-particles were charged with negative electricity However, the evidence, as already stated, is not conclusive, because the possibility that the observed charge is due to the collision of the snow-particles with the tray was not entirely eliminated Our many duties unfortunately did not permit us to subject the question to a more elaborate study, as would be desirable in order to verify Simpson's theory, which explains all the abnormal potential-gradient observed on the *Maud* Expedition

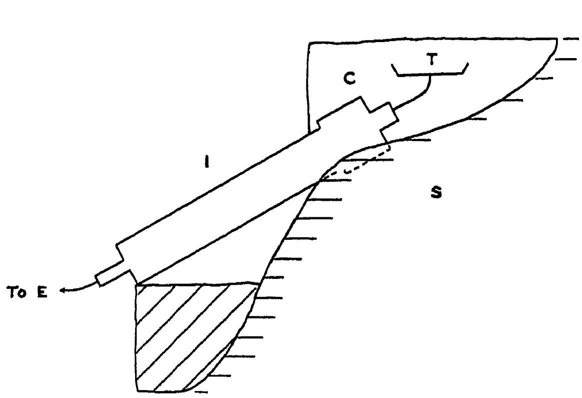


FIG 35—Diagrammatic sketch illustrating method of determining electric charge on snow

(*c*) *Potential gradient and wind-direction*—In order to examine whether a relation exists between the potential gradient and the direction of the wind, the observed potential-gradients have been divided into four groups, as in Table 55, reckoning wind from northwest to northeast as wind from north, wind from northeast to southeast as wind from east, and so on. Using a grouping of this kind implies some smoothing, because all values corresponding to wind from northwest, northeast, southeast, and southwest will be entered in two columns For the first winter the potential gradients observed at 22^h G M. T. were grouped according to the simultaneous wind-direction and for the last two winters the mean daily potentials were grouped according to the average wind-direction of the day.

TABLE 55—*Potential Gradient and Wind-Direction*

Period	Wind-direction			
	NW–NE	NE–SE	SE–SW	SW–NW
	v/m	*v/m*	*v/m*	*v/m*
Potential gradient at 22^h, October 1922–May 1923	117	112	116	122
Mean daily potential-gradient, October 1923–April 1924	117	114	110	112
Mean daily potential-gradient, November 1924–April 1925	95	93	80	88

During the first two winters, when far off the coast, the differences between the potential gradients for the various wind-directions are so small that they are without

significance. During the last winter the gradient seems to be smallest for southerly winds, which means winds blowing from the mainland toward the ice. This result may represent a real feature, connected with a different ionization of the air coming from the land as compared to the air blowing from the sea-ice. However, the result needs further confirmation. It may be noted that the combined results from the two winters in the drift-ice show a small effect in the same direction. The fact that the potential gradient was considerably smaller close to the coast than farther out in the ice, and that this difference increased with wind from land, also indicates that the influence of the land tends to lower the potential gradient.

(*d*) *Potential gradient during snowfall*—It has already been stated that the only negative potential-gradient which was observed occurred during snowfall and slight drift. With the exception of this single case, the gradient was generally normal, but subject to large and rapid variations, making eye-readings difficult and giving the recorded curves a ragged appearance. From the three periods, 65 observations of the potential gradient are available from hours when snow was falling and when the wind velocity was too small to cause snow-drifts. The mean value for these hours can be compared with the corresponding mean on meteorologically undisturbed days, which will be defined later The influence of the diurnal variation and the station-difference must be eliminated, and this is easily done by entering the "normal" value of the gradient for the given hour and station beside each observed gradient during snowfall and by taking the mean of both columns. We find that the mean potential-gradient during snowfall on calm days was 106 volts per meter, while the corresponding mean value on meteorologically undisturbed days was 103 volts per meter

It is seen that the two mean values are nearly the same. It may be added that excessively high or low values deviating more than ±50 per cent from the normal value of the hour were never observed during snowfall.

(*e*) *Potential gradient during fog or haze*—During fog or haze the potential gradient was normal in most cases, but occasionally very high Eighty-seven hourly values are available with fog or haze present and with light wind blowing Computing the mean values in the same way as above, we find that the mean potential gradient during fog or haze on calm days was 120 volts per meter, while the corresponding mean value on meteorologically undisturbed days was 112 volts per meter.

The mean values agree again rather closely, but, examining the single cases, we find that excessively high values of the gradient occurred seven times during fog or haze

(*f*) *Potential gradient and cloudiness*—Grouping the potential gradient, observed with light wind at 22^h G. M. T during the period October 1922 to May 1923, according to the simultaneously observed cloudiness (scale 0 for clear, to 10 for overcast) we find.

Amount of clouds .	0–2	3–7	8–10
Potential gradient, volts per meter	106	118	121
Number of cases . .	61	22	48

According to this, it seems that overcast sky is accompanied by a higher potential-gradient. However, if we examine the mean diurnal-values observed on clear days during the winters 1923 to 1924 and 1924 to 1925, we find that the mean values for these days come very close to the mean of the days on which the sky has been partly overcast. We find:

Period	Potential gradient in volts per meter for	
	Clear days (Cloudiness less than 5)	Partly overcast days (Cloudiness greater than 5)
Winter, 1923 to 1924 .	115 (42)	112 (49)
Winter, 1924 to 1925	87 (19)	95 (42)

The results are discordant, during one winter we find a lower potential on clear than on partly overcast days, during the other a higher The conclusion, therefore, is that there is no outstanding relation between the amount of clouds and the value of the potential gradient but that the latter has a tendency to be higher when the sky is overcast

(g) *Potential gradient and relative humidity*—F. Malmgren has made an interesting investigation of the relative humidity of the air over the Arctic Sea He finds that this quantity is subject to very small variation. If the relative humidity is referred to the vapor-tension over ice, the air is always found to be nearly saturated, in cold, calm weather with clear sky the relative humidity (ice) will be somewhat over 100 per cent, while with wind blowing it will be a little below 100 per cent Considering the small variations, no outstanding relation between relative humidity and potential gradient can be expected The number of observations is too small to permit definite conclusions, but they confirm the opinion that there is no marked relation By far the greater number of observations of the humidity were taken about 23^h G. M T, and utilizing these only it becomes unnecessary to eliminate the diurnal variation In 42 cases the potential gradient was undisturbed by drift or fog, and from these we find

Mean relative humidity referred to ice, per cent	96	104
Mean potential-gradient, volts per meter	107	101
Number of cases	20	22

From these data there does not appear to be any marked relation between the two phenomena

(h) *Potential gradient and temperature*—Discussing the relation between potential gradient and temperature, we will utilize the observations from the periods November to February only, because the gradient had nearly the same mean value during these months, so that a possible relation between gradient and temperature is not influenced by the annual variation The observations of the potential gradient at 22^h G M T from November 1922 to February 1923 and the diurnal mean values from the next two winters are grouped according to the temperature at 22^h and the mean diurnal temperature in Table 56

TABLE 56—*Potential Gradient and Temperature of the Air*

Period	Temperature limits			
	Greater than −26° C	−26° C to −30° C	−31° C to −35° C	Less than −35° C
Potential gradient at 22^h, November 1922–February 1923	101	123	114	118
Mean daily potential-gradient, November 1923–February 1924	117	106	108	117
Mean daily potential-gradient, November 1924–February 1925	91	85	88	82
Unweighted mean	103	105	103	106
Total number	52	42	52	34

This investigation shows no relation between temperature of the air and potential gradient during the period November to February, when the temperature ranged between −20° and −40° C

(i) *Selection of meteorologically undisturbed days*—The above discussion of the relation between meteorological phenomena and the potential gradient leads to the conclusion that definite evidence of such a relation is found only for snow-drift caused by sufficiently high wind-velocities and occasionally for fog and haze To eliminate the cases when disturbed values of potential gradient could be referred to a definite meteoro-

logical cause the following procedure was adopted. The curves of the potential gradient were compared with the hourly values of the wind-velocity. Whenever a rise of the potential occurred simultaneously with an increase of the wind-velocity to values greater than four meters per second, it was assumed that the increase of the potential was due to snow-drift and the day was regarded as disturbed. The remaining days were then inspected, and when again abnormal high values of the potential occurred on days when fog or haze had been noted, these days were excluded On the remaining days, 91 from October 1923 to April 1924, and 61 from November 1924 to April 1925, a few irregularities occurred which might be associated with haze or fog that had disappeared at the time of the meteorological observations or which may represent disturbances which have nothing to do with the meteorological conditions

The selection of the undisturbed days upon which the study of the periodic variations was based was undertaken at an early stage as a result of preliminary investigations, and in the preceding discussion extensive use has been made of the values from these selected days. In Tables 52 and 53 the selected days are those which are not inclosed in brackets.

(2) VARIATIONS OF THE POTENTIAL GRADIENT

The data obtained, while necessarily limited in period for reasons as stated, seem sufficient for some investigations of monthly and diurnal variations of the potential gradient, the results of which follow.

(*a*) *Monthly variation*—The observations unfortunately do not cover the whole year, but only eight, seven, and six months respectively, so that they do not give complete information regarding the annual variation, but we may discuss the variation from October to May. Table 51 contains the monthly mean values of the potential gradient at about 22^h G M T. as determined from eye-readings during October 1922 to May 1923. The observations for diurnal variation show that the value of the gradient at this hour is about 6 per cent above the mean value for the day, so that these values have been reduced by 6 per cent to obtain daily mean values For the two other periods when a recording electrometer was operating, the monthly means of the diurnal means on undisturbed days are entered in the tables. All values are arranged together in Table 57.

TABLE 57—*Mean Monthly Potential-Gradients on Meteorologically Undisturbed Days*

Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Mean
	v/m	*v/m*	*v/m*	*v/m*	*v/m*	*v/m*	*v/m*	*v/m*	*v/m*
1922–1923	*94*	104	102	112	100	122	**123**	107	108
1923–1924	114	*96*	119	108	108	113	**132**		113
1924–1925		80	96	*78*	94	104	**105**		93

By means of Table 57 we can express each monthly value in per cent of the mean value for the period and take the mean for all three periods as Table 58.

TABLE 58—*Mean Monthly Potential-Gradient on Meteorologically Undisturbed Days, Expressed in Per Cent of the Mean for the Periods*

Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1922–1923	87	96	94	104	93	113	114	99
1923–1924	101	85	106	96	96	100	117	
1924–1925		86	103	84	101	112	113	
Mean	94	*89*	101	95	97	108	**115**	99

In none of the three series do we find indication of an annual variation, with maximum potential-gradient around December and January, as has been found at numerous stations in both the northern and the southern hemispheres [9] All three periods combined give a maximum in April and a minimum in November Within each period the greatest value found was in April Hoffman[10] finds a maximum in April at Ebeltofthafen, Spitzbergen, but ascribes it to snow-drift, even though he has left out the cases in which the potential was very disturbed The influence of snow-drift has been carefully eliminated from the present data, and therefore can not be made responsible for the high values in April April also was a month in which fog and haze always were rare We can only accept the result and await further evidence

(b) *Diurnal variation*—Recent investigations have shown that, for the study of the diurnal variation of the potential gradient, it is of great advantage to utilize only days for which complete observations through 24 hours are available. In the Arctic Sea it was possible to obtain a fairly large number of complete daily records in all seasons except the summer, when prevailing fog and great humidity caused insulation difficulties, which we did not succeed in overcoming. The only meteorological factors which disturbed the potential gradient were snow-drift and occasional fog

From October 1922 to May 1923, eighteen series for diurnal variation were obtained by eye-readings through 24 hours. Of these a few have to be eliminated, namely, December 11–12, 1922, and the last four series at the end of April and in May 1923 On December 11–12, 1922, the potential was very disturbed, but for reasons which could not be associated with meteorological conditions If a great number of observations had been available the writer would not have eliminated this day, but considering the small number of days, he feels justified in leaving out a day which does not show the characteristic diurnal-variation which appears on all others

The last four series have also been eliminated, because they show a diurnal variation which is practically the reverse of the ordinary In these cases it seems very likely that the insulation was very poor during the local night hours from 10^h to 19^h G M T, when heavy frost formation took place Unfortunately, the insulation was not tested during these hours, but our later experiences regarding the effect of the frost formation and the fact that later we never recorded a reversed diurnal variation in April or May make it very probable that the night values of the series we are discussing were erroneous For the period October 1922 to April 1923 there remain thirteen series For the periods October 1923 to April 1924 and November 1924 to April 1925, 91 and 61 complete daily records are available, respectively Table 59 shows how these complete days are distributed through the various months and also gives the geographic positions

The mean hourly values for the days which are suited for examination of the diurnal variation are entered at the bottom of Tables 52 and 53. The values for the winter 1922 to 1923, however, have to be reduced, because the mean potential-gradient on the 13 days with complete observations through 24 hours is 120 5 volts per meter, while the mean gradient derived from the mean monthly value for the same period (Table 54) is only 108 1 volts per meter The mean hourly values at the bottom of Table 52, therefore, have to be multiplied by 0 894 in order to be reduced to the mean value for the period For the other periods no such reduction is necessary.

Table 54 contains the departures from the mean hourly values of the potential gradient For the winter 1922 to 1923, only the mean result from the thirteen series has been entered, but for the two other periods mean values for the months, for the winter, for the spring quarter-years, and for the whole periods are tabulated It is seen that

[9] L A BAUER Sunspots and annual variation of atmospheric electricity *Res Dep Terr Mag*, vol V, pp 359–384

[10] K HOFFMAN Bericht über die in Ebeltofthafen auf Spitzbergen in den Jahren 1913–1914 durchgeführten luftelektrischen Messungen *Beitr z Physik d freien Atmos*, vol 11 (1923), pp 1–19

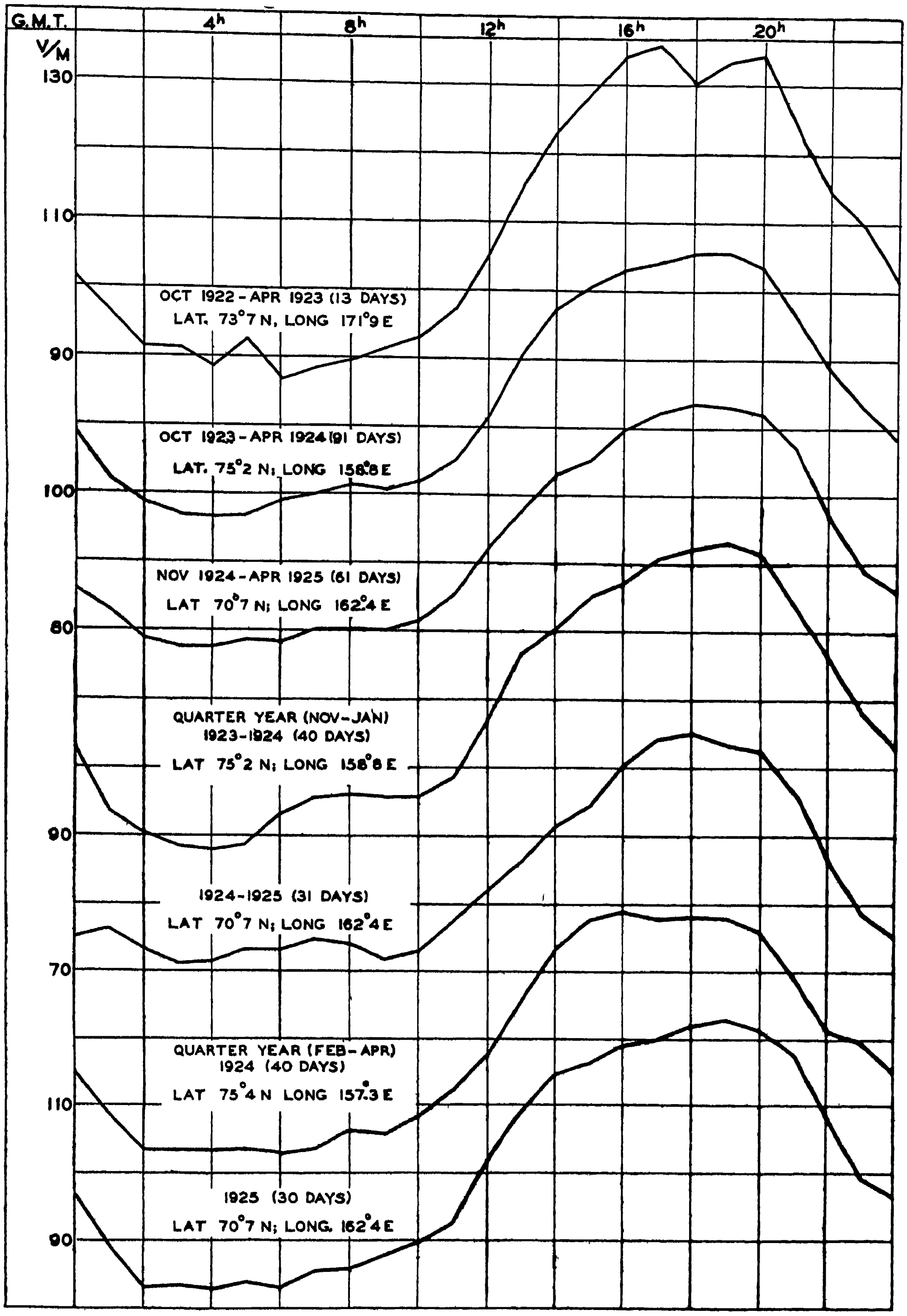


FIG 36—Diurnal variation of atmospheric potential-gradient, basis of Greenwich mean time, meteorologically undisturbed days for winter and for quarter-years centering on December and March

the diurnal variation has the same characteristic in all months and all periods, the minimum value is always found between 2^h and 8^h G M T, the maximum between 15^h and 20^h Comparing the mean diurnal variation for the three periods, we find a remarkable agreement, which is best shown by Figure 37, in which the mean potential-gradient has been represented graphically. The agreement goes still further, as for the two winters from which registrations are available we find that the diurnal variation agrees astonishingly well for the two periods November to January and February to April, respectively (Fig 36). Considering this, it seems justifiable to conclude that the diurnal variation of the potential gradient as represented in Figure 36 is quite typical for the whole region off the coast of northern Siberia between longitudes 150° and 180° east of Greenwich, and free of local characteristics, in the limited sense of the word Since all observations are taken under similar conditions, it is possible that they show features which are characteristic for this region, but none which is associated with the conditions at the individual stations.

TABLE 59—*Number of Complete Daily Records of Potential Gradient and the Mean Geographic Position for Each Month*

Winter and position	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Whole period	Nov, Dec, Jan	Feb, Mar, Apr
Winter 1922–1923	1	4	1	2	3	1	1	13		
	°	°	°	°	°	°	°	°		
North latitude	72 9	73 3	73 5	73 6	74 1	74 2	74 3	73 7		
East longitude	177 2	174 0	171 1	170 6	170 2	169 8	168 6	171 9		
Winter 1923–1924	11	11	14	15	12	13	15	91	40	40
	°	°	°	°	°	°	°	°	°	°
North latitude	74 9	75 1	75 3	75 1	75 2	75 2	75 7	75 2	75 2	75 4
East longitude	163 4	160 3	158 7	157 4	158 5	158 5	154 8	158 8	158 8	157 3
Winter 1924–1925		11	9	11	11	11	8	61	31	30
North latitude	70° 43′									
East longitude	162 25									

(3) RESULTS OF HARMONIC ANALYSES

The mean values for the three periods and for the two quarter-years of the last two winters have been analyzed and the Fourier constants computed according to the formula

$$P.G = \overline{P\ G} + \sum_1^n c_n \sin\ (nt + a_n)$$

where t means G M. T reckoned from midnight, are compiled in Table 60

TABLE 60—*Fourier Constants for the Diurnal Variation of the Potential Gradient*

Period	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	v/m	°	v/m	°	v/m	°	v/m	°
Oct 1922–Apr 1923	24 4	184 7	4 4	287 3	1 6	195	1 1	295
Oct 1923–Apr 1924	20 1	187 6	3 9	271 4	1 6	181	1 5	354
Nov 1924–Apr 1925	18 5	186 9	4 1	264 8	1 4	232	1 3	2
Nov 1923–Jan 1924	22 0	187 6	4 7	248 1	2 0	179	1 8	8
Feb–Apr 1924	19 1	189 6	3 0	294 2	1 5	166	0 8	342
Nov 1924–Jan 1925	16 2	186 2	5 5	270 5	1 1	273	1 3	12
Feb–Apr 1925	20 9	187 5	2 8	253 3	2 1	212	1 3	350

As we must expect from the agreement of the curves, we find a very good agreement between the harmonic constants For the entire period the agreement is excellent for

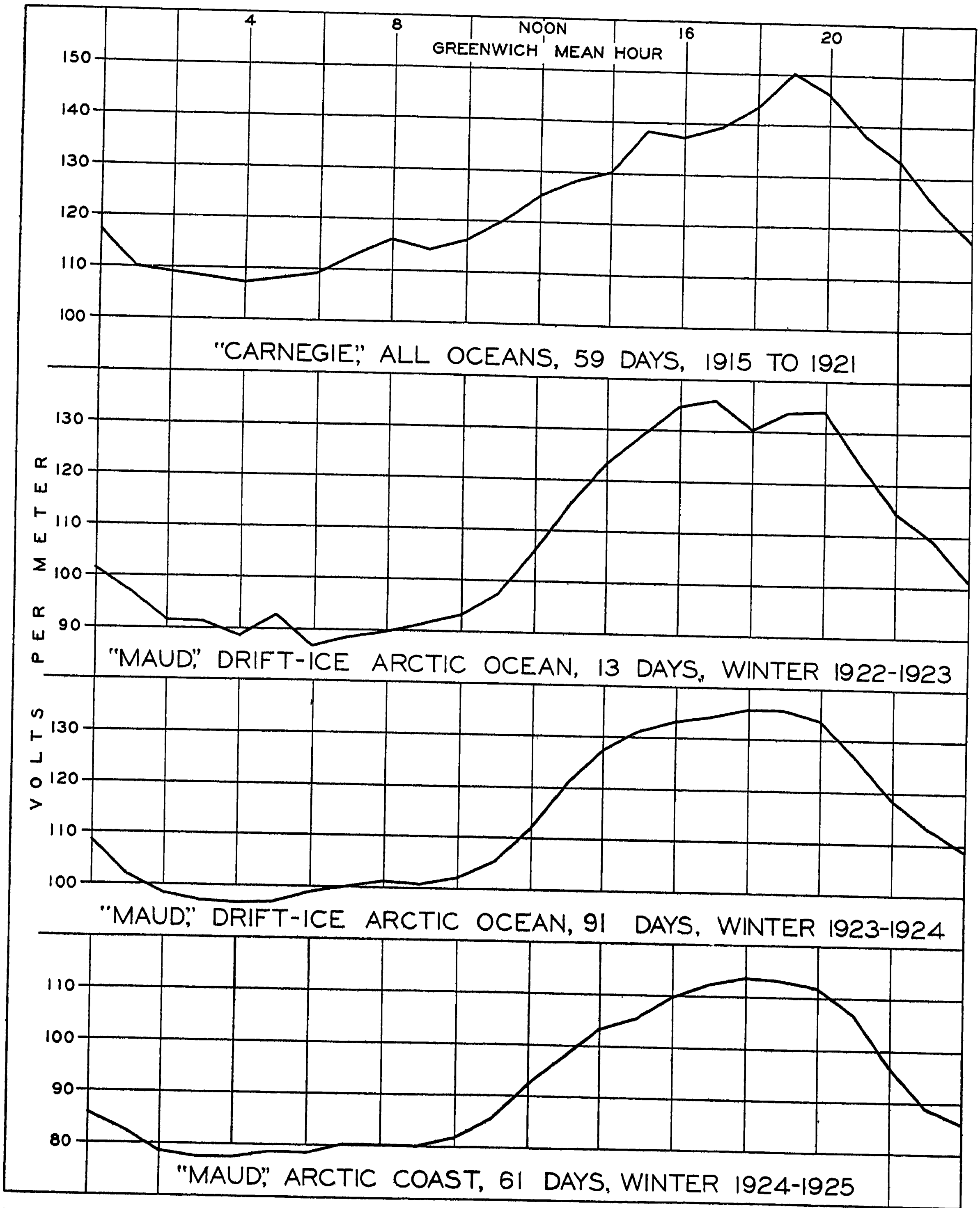


FIG 37—Daily variation of atmospheric potential-gradient, showing simultaneous predominant 24-hour wave for the *Carnegie* results, all oceans, 1915-21, and for the *Maud* drift-ice and Arctic-Coast observations, three winters 1922 to 1925

the first two terms, but it is noteworthy that, comparing the results from the two winters with registrations, we also find a remarkable agreement in the fourth term For the quarter-years we find that the phase-angles of the first and the fourth terms not only agree at both stations, but that they also show the same change from winter to spring The phase-angles of the second term agree fairly well, but change in opposite directions, while the phase-angles of the third term deviate considerably It seems as if the 24-, 12-, and 6-hour terms are necessary to give an analytical expression of the diurnal variation, but whether the 8-hour term is essential or not is doubtful In the above cases it may represent accidental deviation

Attention may also be drawn to the fact that, in the last two winters, we find a decrease of the amplitudes of the 12-hour term from winter to spring During the greater part of the periods November to January the Sun in both years was below the horizon and the meteorological elements, temperature, wind, and cloudiness, showed in this season a negligible diurnal-variation as compared to the corresponding diurnal-variation in February to April This circumstance points to the conclusion that at least part of the 12-hour term is not associated with the diurnal variation of the meteorological elements

It is of interest to examine whether the agreement between the phase-angles would be improved if referred to local time

TABLE 61—*Phase-Angles Referred to Local Mean Time*

Period	α_1	α_2	α_3	α_4
	°	°	°	°
Oct 1922–Apr 1923	356 6	271 1	350	263
Oct 1923–Apr 1924	346 4	229 0	297	278
Nov 1924–Apr 1925	349 3	229 6	359	297
Greatest difference when referred to L M T	10 2	42 1	62	34
Greatest difference when referred to G M T	2 7	22 5	52	66

From Table 61 we find that the difference between the phase-angles referred to L M T is greater than the differences when referred to G M T for all phase-angles except the fourth, and that the discrepancy is relatively greatest for the dominating term We find the best agreement when we refer the variation to G M T

(4) RELATION BETWEEN THE POTENTIAL GRADIENT AND THE AURORA

The question of a possible relation between the potential gradient and the aurora has been answered in different ways by different observers A few maintain that a definite correspondence between simultaneous variations of the potential gradient and the aurora is present, while others have been unable to detect any connection The experience from the *Maud* Expedition is that no connection can be found Several series of eye-readings for diurnal variation of the potential gradient in the winter 1922–23 were taken during brilliant displays of aurora, but no correspondence between the variation of the aurora and the potential gradient was observed During the following winters, 1923 to 1924 and 1924 to 1925, when the potential was recorded continuously, the writer frequently watched the recording electrometer during displays of aurora without discovering anything of an unusual character in the behavior of the potential

The preliminary result at which we arrived in the field, namely, that there is no relation between the potential gradient and the aurora, is confirmed by a statistical investigation based on the data from 1923 to 1925 When discussing the observations of the aurora, we introduced an "auroral character-number," as defined in the following

part of this discussion of the *Maud* results. This character-number is a measure for the amount and the intensity of aurora during the night between 22^h and 6^h or, referred to Greenwich time, from about 10^h to 18^h of the date on which the observations of the night began. The mean daily values of the potential gradient referred to Greenwich time, the absolute daily-ranges of the hourly values, and the electric character-numbers, which are measures for the magnitude of the short, periodic electric disturbances, have been grouped according to the auroral character-number, resulting in the values compiled in Table 62. All data regarding the potential gradient refer to conditions on meteorologically undisturbed days.

TABLE 62—*Relation on Meteorologically Undisturbed Days between Potential Gradient and Aurora*

Period	Auroral character-number	Potential gradient		Electric character-number	Number of cases
		Mean value	Diurnal range		
		v/m	*v/m*		
1923–24	1.6	111	78	0.7	15
	7.1	122	76	0.8	12
	14.1	108	63	0.8	14
	20.5	110	66	0.3	8
1924–25	1.6	93	53	0.8	18
	6.4	75	48	0.7	7

The observations during the winter of 1923–24, which are the most complete, indicate no marked relation between the atmospheric potential-gradient and the aurora, even though the intensity of the auroral display varies within wide limits. Both the mean value of the gradient and the diurnal range show a tendency to a decrease with increasing auroral character-number, and this tendency is found also from the observations in the winter of 1924 to 1925 at a more southerly latitude. The displays of the aurora at this latter station were generally weak and the statistics, therefore, cover only a small range. Apparently no relation exists between the intensity of the minor disturbances of the atmospheric potential-gradient and the aurora.

The writer, therefore, concludes, on the basis of the experiences in the field and of the final examination of the various records, that no relation exists between the minor disturbances of the atmospheric potential-gradient and the auroral displays, but that an increase of the intensity of the aurora appears to be accompanied by a decrease of both value and diurnal range of the potential gradient. The last conclusion, however, is based on too few data and concerns a subject which needs further examination.

(5) COMPARISON WITH OTHER OBSERVATIONS

From the observations of the potential gradient over the oceans, carried out on the cruises of the *Carnegie* from 1915 to 1921, S. J. Mauchly[11] has concluded that the principal part of the diurnal variation of the potential gradient follows universal time in such a way that the maximum value of the gradient is reached simultaneously over all oceans at about 18^h G. M. T. in the mean for the whole year. Karl Hoffman[12] has concluded independently that the diurnal extreme values of the potential gradient are reached at the same universal time, both in the Arctic and the Antarctic regions. None of the stations he considers is far from 0° of longitude. He therefore adds that an important test of this conclusion could be obtained by records of the potential gradient extended over one year at a station in the Arctic not far from the one hundred and eightieth meridian of longitude.

[11] See footnote 2. [12] See footnote 10.

Our observations in the Arctic Sea far from land or close to the coast near the one hundred and sixtieth meridian of east longitude give positive confirmation of the conclusions by Mauchly and Hoffmann It seems unnecessary here to enter upon a discussion of the evidence for the universal characteristic of the diurnal variation of the potential gradient from the many stations which have been compiled by Mauchly, but it will be appropriate to compare our results in detail with the corresponding results from the oceans which Mauchly has discussed

Table 63 contains the phase-angles and the amplitudes expressed in per cent of the mean gradient for the two periods November to January and February to April as derived from our observations over the Arctic Sea and from the *Carnegie* observations over all oceans. However, it must be remembered that the *Carnegie* values are based on only 18 and 12 series, respectively, and therefore can not claim any deciding importance

TABLE 63—*Phase-Angles and Amplitudes in Per Cent of the Diurnal Variation of the Potential Gradient*

Period	Locality	Phase-angles				Amplitudes, per cent			
		a_1	a_2	a_3	a_4	c_1	c_2	c_3	c_4
		°	°	°	°				
Nov–Jan	Arctic Sea, *Maud*	187	259	226	10	19 8	5 4	1 6	1 6
	All Oceans, *Carnegie*	202	224	242	4	15	2	1	1
Feb–Apr	Arctic Sea, *Maud*	189	274	189	346	18 4	2 6	1 7	1 0
	All Oceans, *Carnegie*	197	279	317	337	19	4	1	2

Comparing these values, we find agreement between the phase-angles of the 24-, 12-, and 6-hour terms not only as to absolute value, but also as to change from one season to another, except for the first term, for which the seasonal change is very small from winter to spring, but that the 8-hour term is not in agreement This result confirms the view that the 24-, 12-, and 6-hour terms are necessary to express the universal part of the diurnal variation The relative values of the amplitudes are in good agreement and the small value of the 8-hour term, which is the only one which can not be attributed to a universal characteristic, shows that local conditions are of very small importance These conclusions are in good agreement with Mauchly's result, except that he has found evidence for a 6-hour term of local character, but he draws attention to the fact that a far greater number of observations is necessary in order to reach definite results

The main results of the above discussion of the potential-gradient observations on the *Maud* Expedition 1922 to 1925 can be summarized as follows (1) The atmospheric electric potential-gradient over the Arctic Sea is remarkably undisturbed by local conditions, the diurnal-variation having the same character over a wide region; (2) the observed diurnal-variation confirms strongly the conclusion that this variation is of universal character, the extreme values being reached simultaneously over the whole Earth

Part V—OBSERVATIONS OF THE AURORA, 1918–1925

By H U Sverdrup

Introduction

Observing and photographing the aurora took an important place in the scientific program of the Expedition The equipment included two of C Stormer's cameras, two field-telephones, telephone wire, and stock of photographic plates and chemicals Thus we had equipment for establishing two stations, from which photographs could be taken simultaneously for computation of the height and the position in space of the aurora [1] However, the irregular movements of the drift-ice made work from two stations impossible, and even at the winter-quarters on the coast we had, mainly on account of the limited personnel of the Expedition, to give up the plans for establishing two stations and to confine the work to one station The photographs we took of the aurora, therefore, can not serve to determine the height or the position of the display, but only to illustrate typical forms Several circumstances reduced the number of successful photographs below that we had hoped to obtain When wintering at Cape Chelyuskin during 1918 to 1919, 13 pictures of brilliant aurora were taken, but at that time it was thought best to save the photographic plates for use in the drift-ice, which we hoped to enter in 1919 However, as it developed, it was unnecessary to economize with the plates at Cape Chelyuskin, since we did not succeed in entering the drift-ice, but had to spend the two following winters of 1919–20 and 1920–21 on the coast During the winter of 1919–20 there was no opportunity to take any photographs, because the writer was away from the ship In 1921 it was found that the sensitivity of the plates had decreased so much that no satisfactory pictures could be taken of the weak displays which were characteristic at the station where the vessel wintered from 1920 to 1921

During 1922 to 1924, when in the drift-ice, 82 successful auroral photographs were secured through the efforts of F Malmgren, assistant scientist, O. Dahl, aviator, and the writer The plates at our disposition during this time were considerably less sensitive than those which had been procured in 1918 and used at Cape Chelyuskin For this reason only the most brilliant or the most quiet auroras could be photographed, this circumstance greatly reduced the number of successful pictures

In the winter of 1918–19 the photographs were taken with exposures varying from 3 to 20 seconds, during 1922 to 1924 the time of exposure had to be from 20 to 90 seconds Selected photographs giving a good idea of the various forms of the aurora are reproduced on Plates 9 to 12

Besides obtaining photographs showing the characteristic forms of the aurora, valuable information regarding the aurora can be secured by eye-observations from one station Such observations must be taken during the whole dark period of the day and carried on systematically for a long time if laws for the periodicity of the aurora and the character of the displays are to be found by statistical methods Constant night-watches are evidently necessary to secure sufficient information During the three winters from 1918 to 1921, when the *Maud* wintered on the Siberian coast, night-watches were not established and the notes regarding the occurrence of aurora before 22^h in the evening or after 8^h in the morning are too scanty for satisfactory discussion The most extensive notes were made at Cape Chelyuskin, but they are no longer available, as they were lost when Tessem and Knudsen met their tragic death (see p 516)

When the *Maud* entered the drift-ice in 1922, night-watches had to be arranged because the uncertainty of surroundings made constant vigilance imperative The

[1] See C Störmer Rapport sur une expédition d'aurores boréales à Bossekop et Stors Korsnes pendant le printemp de l'année 1913 Geof Publ, vol I, No 5, Kristiania, 1921

night-watches were kept also during the winter of 1924 to 1925 at Four Pillar Island, mainly to secure continuity in the records The watchmen were instructed to take meteorological observations at certain hours and make extensive notes regarding the auroras These notes in condensed form are given in Tables 64 to 69, which show the detailed data used in the discussion All members of the Expedition took part in the night-watches and deserve the greatest credit for their conscientious observations and their unfailing interest

The observations of the aurora may be further extended at better-equipped stations [2] There investigations of the auroral spectrum and of the distribution of colors and intensity along auroral streamers may be undertaken and possible relations between the aurora and the intensity of radio signals studied We had no opportunity of examining these questions, though it may be mentioned that our radio operator, G Olonkin, repeatedly reported that he could not notice any influence of brilliant auroral displays on the conditions for reception of radio signals

CLASSIFICATION OF AURORA

Since the observations of the aurora were to be taken by untrained observers, it was necessary to adopt the simplest possible classification of this variable phenomenon The following classification was decided upon·

(1) *Glows*—Large or small patches of aurora with indistinct limits, quiet but occasionally of pulsating brightness

(2) *Arches*—Quiet bands, generally crossing the sky from horizon to horizon

(3) *Curtains*—Rapidly moving forms, frequently similar to an arch or a fraction of an arch, but characterized by wave-like appearance of the lower rim and by varying intensity

(4) *Streamers*—Isolated rays, generally changing rapidly

(5) *Corona*—Streamers or curtains converging to a point near zenith, that is, the radiation-point

This classification happens to be identical with the one used on the British Antarctic Expedition 1910 to 1913,[3] but was obtained by simplifying the classification given by L Vegard in his valuable monograph [4] The relation between the groups used by us and by Vegard is evident from the following compilation

Maud Expedition	Vegard	Form
(1) Glow	Glow Pulsating aurora	Quiet
(2) Arch	Quiet arch Quiet bands	
(3) Curtain	Curtain-like arches Curtains	Moving
(4) Streamers	Streamers	
(5) Corona	Corona	

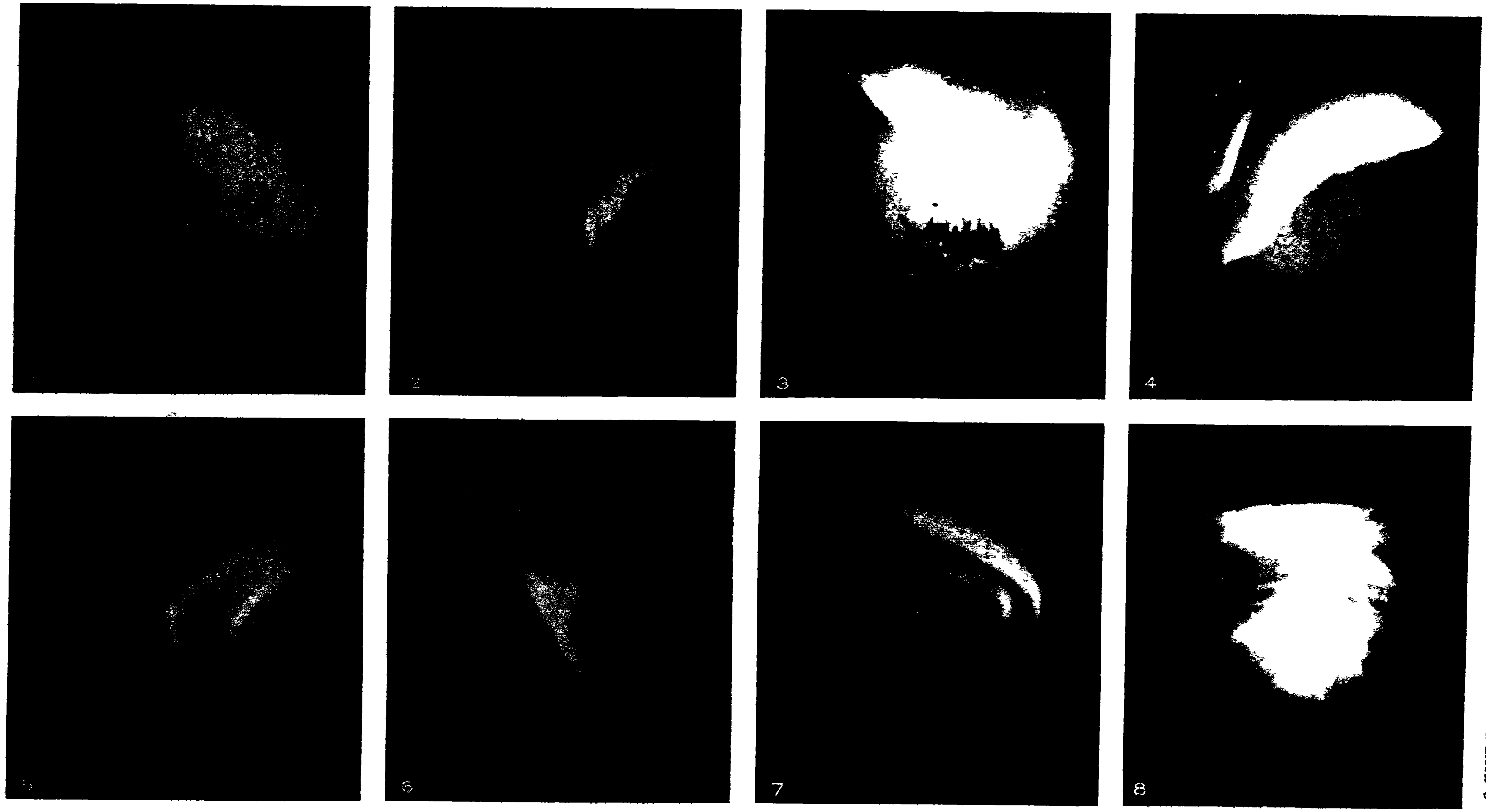
PHOTOGRAPHS OF AURORA

Some typical forms of the aurora are seen in the photographs reproduced on Plates 9 to 12 The white spots in these photographs are, in general, stars, but in some cases are flaws in the negatives The constellations can generally be recognized by close inspection of the original plates and serve for exact location of the aurora on the sky In a

[2] See C STORMER The importance of taking aurora photographs, etc Geof Publ, vol I, No 4, Kristiania, 1920

[3] C S WRIGHT Observations on the aurora British Antarctic Expedition 1910–1913, London, 1921

[4] L VEGARD Bericht uber die neueren Untersuchungen am Nordlicht Jahrbuch d Radioaktivität und Electronik, vol 14, Dec 1917



AURORAL TYPES PHOTOGRAPHED OFF NORTH COAST OF SIBERIA, 1918-1924

1 Intense glow, upper part showing transition to curtains
2 Typical waving curtain, weak streamer to left
3 Moving curtain (blurred by rapid motion), faint glow to right
4 Typical curtain with wave-like structure, weaker aurora to left
5 Curtains tending to ellipses
6 Curved curtain, weak streamers to right
7 Curtains, partly developed concentric ellipses
8 Typical corona, converging streamers lower part band-aurora upper

few of the photographs reproduced, well-known constellations are plainly visible The exposures are all so short that the stars appear as points at the central part of the pictures, but as streaks in the outer part because of distortion. The space-angle covered by each picture is about 42°, this affords an idea of the extension of the auroras which are shown

The following descriptions contain information about when and where the photographs were taken and also about the direction toward which the camera was turned The direction is indicated in most cases by naming the star or constellations which, if nothing else is mentioned, are to be found in the central part of the picture

The various figures of Plates 9 to 12 are described in detail below, with indication of the person who made the exposure Unless otherwise stated, the times are local mean times

Plate 9, Fig 1—Photograph taken by O Dahl 40° under Ursa Major, January 11, 1923, at $22^h 50^m$ in 73° 34′ north latitude and 170° 11′ east longitude An intense glow which in the upper part shows transition to curtains

Fig 2—Photograph taken by O Dahl toward Coma Berenices, October 11, 1922, at $19^h 45^m$ in 72° 42′ north latitude and 179° 53′ east longitude A typical waving curtain with a weak streamer to the left

Fig 3—Photograph take by H U Sverdrup toward Hercules, December 4, 1923, at $19^h 35^m$ in 75° 15′ north latitude and 159° 07′ east longitude A curtain moving so rapidly during the exposure that the picture is blurred, a faint glow to the right

Fig 4—Photograph taken by H U Sverdrup toward Pegasus, February 26, 1919, at $21^h 10^m$ at Cape Chelyuskin in 77° 33′ north latitude and 105° 40′ east longitude Shows typical curtain with the wave-like structure very well developed, very brilliant, with the lower rim of red color, weaker aurora of forms between curtains and glows to the left

Fig 5—Photograph taken by H U Sverdrup toward Cygnus, February 24, 1924, at $23^h 54^m$ in 75° 04′ north latitude and 159° 15′ east longitude Curtains which tend to form ellipses

Fig 6—Photograph taken by F Malmgren toward Perseus, January 11, 1923, at $20^h 30^m$ in 73° 34′ north latitude and 170° 11′ east longitude A curved curtain with weak streamers to the right

Fig 7—Photograph taken by O Dahl toward Leo, December 14, 1922, at $23^h 35^m$ in 73° 22′ north latitude and 172° 54′ east longitude Curtains which appear as concentric ellipses, in this case only part of the ellipses is seen, in other cases the ellipses were completely developed

Fig 8—Photograph taken by H U Sverdrup toward Ursa Major, March 3, 1923, at $23^h 12^m$ in 75° 06′ north latitude and 159° 39′ east longitude This is a typical corona, the converging streamers are seen in the lower part of the photograph, but in the upper the aurora has the form of bands Auroras of this type with only part of the corona well developed were by far the most frequent (Note the five stars of Ursa Major to the left of the center)

Plate 10, Fig 1—Photograph taken by H U Sverdrup toward Serpens on October 11, 1922, at $22^h 04^m$ in 72° 42′ north latitude and 179° 53′ east longitude Arches and curtains

Figs 2, 3, and 4—Photographs taken by O. Dahl toward Corona Borealis of Ursa Major and under Gemini, December 14, 1922, at $20^h 40^m$, $20^h 42^m$, and $20^h 45^m$, respectively, in 73° 22′ north latitude and 172° 54′ east longitude Three photographs of the western end, the middle part, and the eastern end of an arch on the northern sky with a sharp lower boundary but an indistinct upper which is a typical feature Ursa Major is plainly visible in the middle picture, while Gemini are found in the upper part of the view of the eastern end Note that the eastern end itself disappears behind clouds

Fig 5—Photograph taken by O Dahl toward northwest, January 6, 1924, at $22^h 25^m$ in 74° 57′ north latitude and 158° 45′ east longitude Curtains moving so rapidly during the exposure that they appear blurred

Fig 6—Photograph taken by F Malmgren above and to the left of Gemini, March 12, 1924, at $1^h 55^m$ in 75° 12′ north latitude and 158° 42′ east longitude Glow with tendency to formation of bands (arches)

Fig 7—Photograph taken by H U Sverdrup toward west, November 10, 1918, at $20^h 58^m$ in 77° 33′ north latitude and 105° 40′ east longitude The western part of a narrow arch

Fig 8—Photograph taken by H U Sverdrup toward Cetus, October 11, 1922, at $21^h 35^m$ in 72° 42′ north latitude and 179° 53′ east longitude A very narrow but intense curtain with a weak corkscrew-shaped curtain to the left

Plate 11, Fig. 1—Photograph taken by H. U Sverdrup toward north, November 10, 1918, at $20^h\ 18^m$ in 77° 33′ north latitude and 105° 40′ east longitude Middle part of arch and a curtain under the arch

Fig 2—Photograph taken by O Dahl toward Arcturus, November 18, 1922, at $21^h\ 05^m$ in 73° 16′ north latitude and 173° 53′ east longitude Lower part of broad arch

Fig 3—Photograph taken by H U Sverdrup toward Andromeda, February 26, 1919, at $20^h\ 51^m$ in 77° 33′ north latitude and 105° 40′ east longitude Rapidly moving curtain

Fig 4—Photograph taken by F Malmgren, November 14, 1923, at $20^h\ 05^m$ in 73° 14′ north latitude and 174° 28′ east longitude. Arch, tending to moving curtains

Fig 5—Photograph taken by F Malmgren toward Arcturus, March 12, 1924, at $22^h\ 35^m$ in 75° 12′ north latitude and 158° 37′ east longitude. Curtains

Figs 6, 7, and 8—Photographs taken by F Malmgren toward Venus, March 12, 1924, Figure 8 at $23^h\ 30^m$, Figure 7 at $23^h\ 32^m$, and Figure 6 at $23^h\ 36^m$, respectively, in 75° 12′ north latitude and 158° 42′ east longitude Pictures of curtains taken at intervals of two and of four minutes, showing the rapid changes Figure 6 is blurred on account of the movement of the aurora during the exposure

Plate 12, Fig 1—Photograph taken by H. U. Sverdrup toward west, February 26, 1919, at $21^h\ 20^m$ in 77° 33′ north latitude and 105° 40′ east longitude Glow, to the right the western end of an arch

Fig 2—Photograph taken by O. Dahl under Ursa Major, January 6, 1924, at $22^h\ 27^m$ in 74° 77′ north latitude and 158° 45′ east longitude Lower ends of broad arches

Fig 3—Photograph taken by H U Sverdrup toward Arcturus, March 11, 1924, at $22^h\ 12^m$ in 75° 12′ north latitude and 158° 42′ east longitude Corkscrew-shaped curtains

Fig 4—Photograph taken by O Dahl toward Aldebaran, December 14, 1922, at $20^h\ 35^m$ in 73° 22′ north latitude and 172° 54′ east longitude Corkscrew-shaped curtain

Fig 5—Photograph taken toward Pegasus, February 26, 1919, at $21^h\ 22^m$ in 77° 33′ north latitude and 105° 40′ east longitude Arch and glow

Fig 6—Photograph taken by F Malmgren, November 14, 1923, at $21^h\ 00^m$ in 75° 11′ north latitude and 160° 17′ east longitude Curtain

Fig 7—Photograph taken by H U Sverdrup toward west, November 10, 1918, at $20^h\ 53^m$ in 77° 33′ north latitude and 105° 40′ east longitude Western ends of arches (bands).

Fig 8—Photograph taken by H. U Sverdrup toward Altair, October 11, 1922, at $22^h\ 00^m$ in 72° 42′ north latitude and 179° 53′ east longitude Curtains of elliptic form

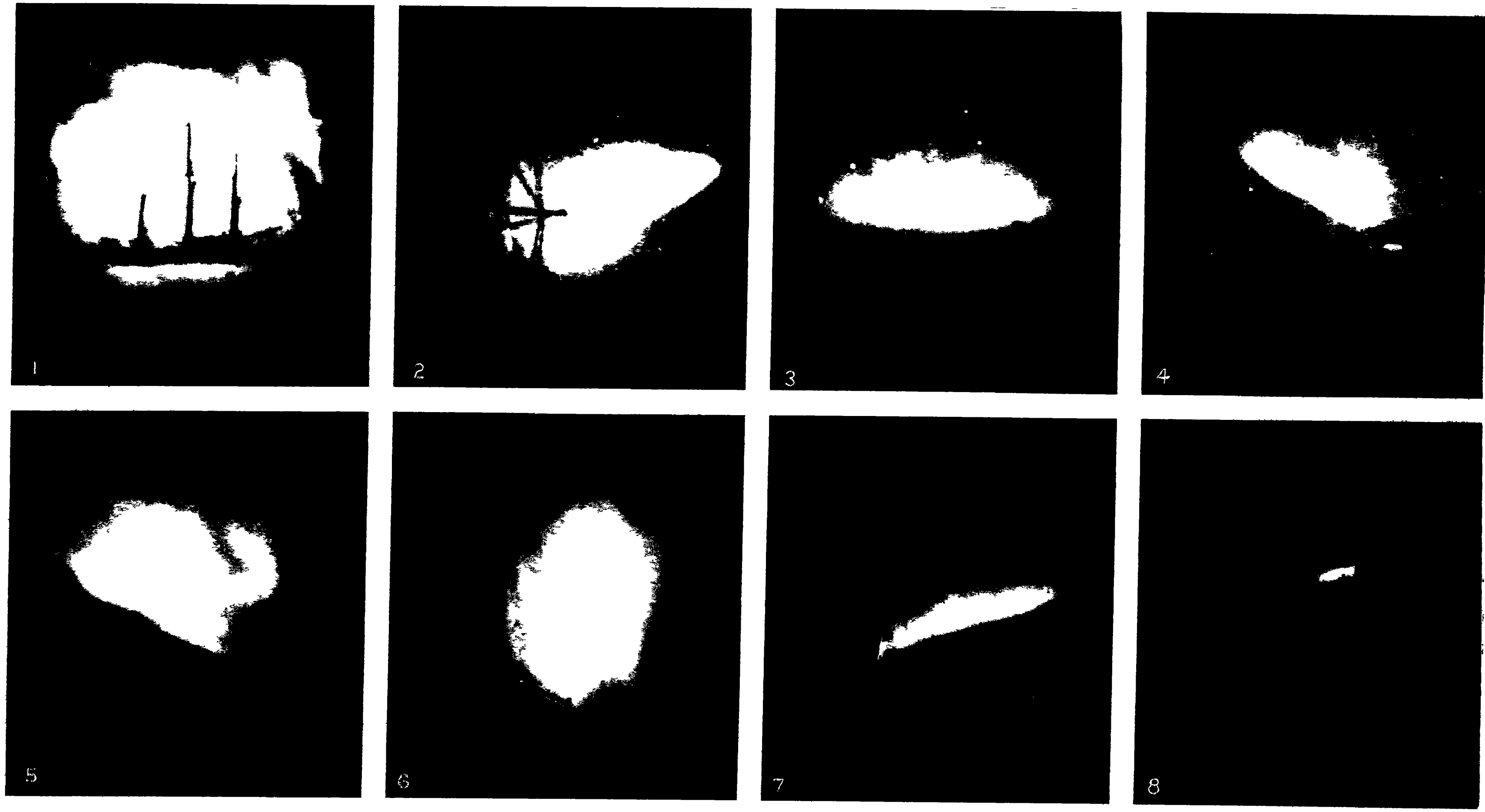
METHODS OF OBSERVATION

The greater part of the auroral observations was made during 1922 to 1925, as already mentioned, by the night-watchmen The night-watches were arranged in the following manner There were four watches of 2 hours each from 22^h to 6^h by four watchmen who took "turning" watches The man who had the watch from 4^h to 6^h on one night would on the following night have the watch from 2^h to 4^h, and so on The system of "turning" watches was evidently of advantage for auroral observation, because the hours in which one man observed were distributed thus over the whole night and personal differences of opinion as to the correct description of many forms or estimates of directions or altitudes would be averaged out

During the first winter the morning watch from 6^h to 8^h was taken by the writer and later by Captain O Wisting, the writer relieving the other watchmen five times a week. Notes regarding displays of aurora in the evening before 22^h were made by F. Malmgren and the writer, but unfortunately not as systematically as desirable.

All observations of aurora were made in the months October to March In the summer we had continuous daylight and in the late spring and early fall only a few hours in the middle of the night were dark. However, in the period October to March the daylight or twilight did not interfere with observations of the aurora between 18^h and 6^h, except from the middle to the end of March, when only brilliant aurora could be seen before 20^h and after 4^h on account of the extension of the daylight.

The night-watchmen were instructed to observe the following procedure. (1) Make notes regarding occurrence of aurora at least at every full hour; (2) describe the aurora



AURORAL TYPES PHOTOGRAPHED OFF NORTH COAST OF SIBERIA, 1918-1924

1 Arches and curtains
2 Western end of arch shown in Figs 3 and 4
3 Middle part of arch shown in Figs 2 and 4
4 Eastern end of arch shown in Figs 2 and 3
5 Rapidly moving curtains causing blurred effect
6 Glow with tendency to form bands
7 Western part of narrow arch
8 Narrow intense curtain, weak cork-screw-shaped curtain to left

by noting the form, the brightness, any conspicuous color, and the state of movement; (3) indicate the part of the sky covered by aurora and always note the true directions to bottom ends of arches and the maximum altitude of the arch above the horizon, (4) direct special attention to the occurrence of coronas by noting the exact time and drawing a sketch showing the position of the radiation-point relative to the stars

The auroral classification adopted has been described above Brightness was noted only when the aurora was unusually faint or brilliant. The true direction to the aurora was given in points and the altitude was measured roughly using the simple rule that, when the arm is stretched out and the thumb and forefinger spread as far as possible, then the angle from the eye between thumb and forefinger is approximately 15°

These instructions could have been improved, and the writer wishes to draw attention to a few points which should be considered in future work of this kind. The instructions did not ask for definite note as to there being no aurora for clear sky For this Expedition it may safely be assumed that if the observations of the cloudiness show that the sky was clear during the night and no notes regarding aurora were made, then no aurora occurred at the full hours, but a positive statement would have been of value, especially because it would have facilitated the discussion. The scale for the brightness could have been more detailed The direction to and altitude of the aurora were obtained by rough methods which could give approximate values only. It is possible to provide a simple arrangement by means of which horizontal and vertical angles could be measured quickly and accurately; such apparatus is recommended to increase materially the value of the single observations This applies especially to the observations on arches Supposing that the lower rim of the arch is about 110 kilometers above the surface of the Earth, then the position in space of the arch can be computed if a number of corresponding directions to and altitudes of the lower rim are measured. Our observations were not accurate enough to allow our investigation of individual cases, but, judging from their good mutual agreement, the mean values appear to be reliable.

TABLES OF RESULTS

The observations of aurora borealis are given in condensed form by Tables 64, 66, and 68. The original notes are frequently very extensive and are accompanied by sketches, but with careful study Malmgren and the writer found it possible to put them into tabular form, with any necessary additional information being given by footnotes. The columns of the table contain (1) Date (changed when passing the one hundred and eightieth meridian); (2) local mean time, generally correct within five minutes (a notation of the form 18^h–22^h refers to observations at the full hours from 18^h to 22^h); (3) form, according to the classification on page 462, using the abbreviations *O* for no aurora, *G* for glow, *A* for arch, *C* for curtain, *S* for streamer, *Co* for corona, *As* for arches (without indication of numbers), *2A* for two arches, and similarly for glows, curtains, and so on; (4) brightness, using the scale of 1 for faint, 2 for average, 3 for strong, and 4 for brilliant; (5 and 6) position in sky and altitude

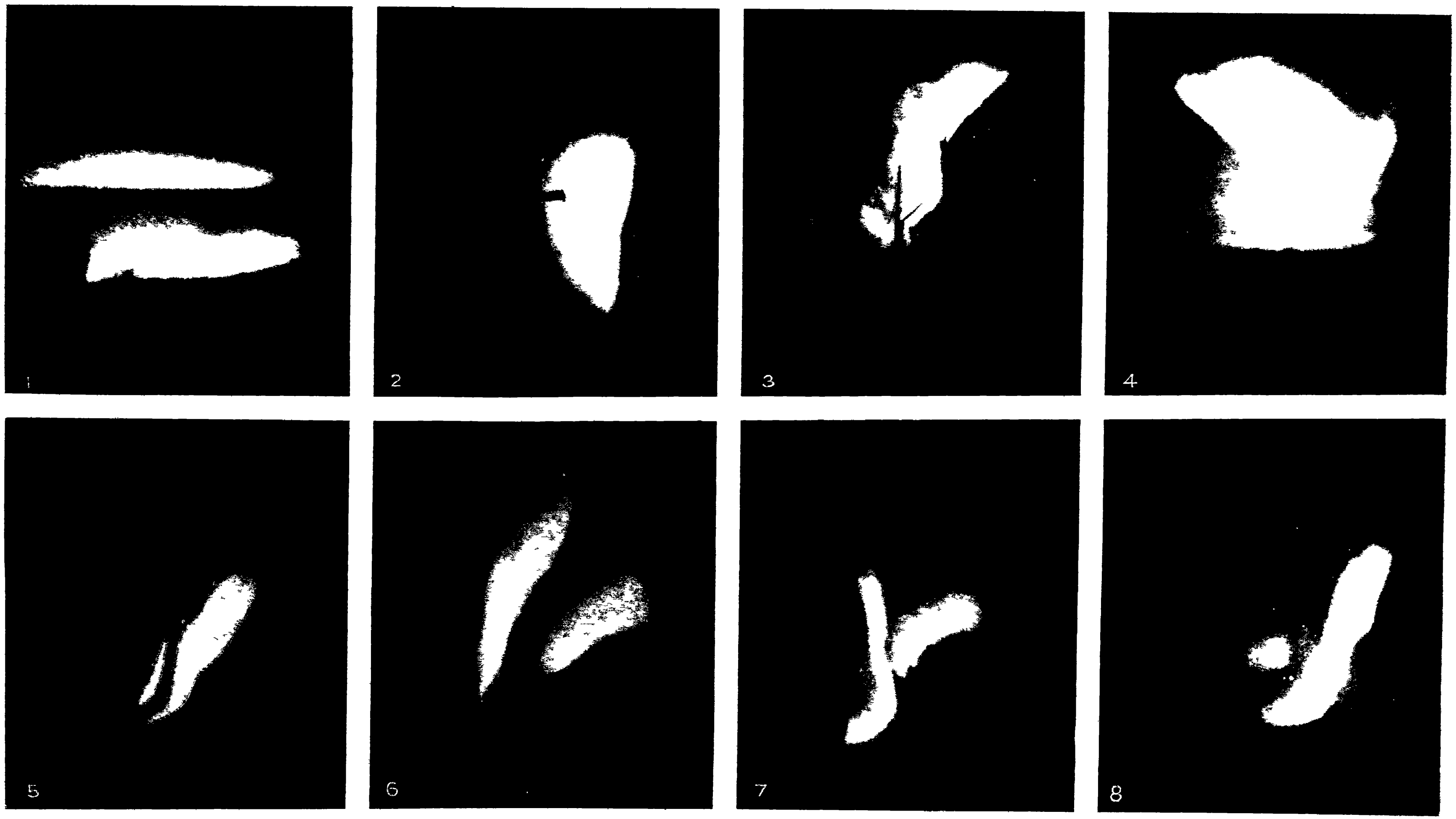
The notations regarding the position in the sky and the altitude depend somewhat on the form of the aurora. For a glow, the direction to the glow, if of small extent, or the part of the sky covered by the glow are given. For instance, *G*, 1, *NE*, 15°, means there was a faint glow in northeast 15° above horizon, while *G*, 1, *E*-sky, 0-30°, means that the eastern sky was covered with a faint glow from the horizon to 30° above the horizon. When an arch was observed, the directions to the end-points and the greatest altitude of the lower rim are noted. If the arch passed through the zenith, this is indicated by the letter *Z* between the directions to the ends, as also by the entry of an altitude of 90°. For example, *A*, 2, *SE–Z–NW*, 90°, means an arch of average brightness

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*

Date	L M T		Form	Intensity	Position	Altitude
1922	*h*	*m*				°
Sep 26	21	00	*G*	2	NE–NW	Low
26	22	45	*C*	2	SE–Z–NW	90
27	1	00	2*A*	2	SE–Z–NW	90
27	1	30	*G*	2	S sky	8–90
27	2	00	*G*	2	S sky	0–90
27	3	00	*G*	1	NE	15
27	20	30	3*C*	2	E–W	90
27	21	00	*O*			
27	22	00	*A*	2	SE–Z–NW	90
27	23	00	*A*	2	SE–NW	90
27	23	45	*C*	2	SE–S–NW	60
28	0	00	*Cs*	2	S sky	0–90
28	1	00	*C*	3	SE–W	45
28	2	30	*C*	2	E–W	ca30
			G	2	NNW	25
28	22	00	*G*	1	E sky	0–30
28	23	45	*C*	4	SE–Z–NW	90
29	1	30	*C*	2	E–Z–W	90
			G	1	SE	20
Oct 2	22	40	*C*	1	SE–Z–NW	90
5	20	40	*C*	3	N sky	
5	20	45	*Co*[a]	1		
			Cs	3	N sky	<60
5	20	50	*Cs*	2	N sky	<45
5	21	00—	*Cs*	1		
5	21	25				
5	21	30	*C*	3	E–N–W	30
5	21	40	*O*			
8	20	00	*C*	1	SE–N–NNW	ca40
8	20	30	*O*			
8	21	00	*O*			
8	21	30	*O*			
8	22	00	*O*			
8	22	40	*A*	1	ENE–NNW	50
8	23	00	*O*			
12	19	00	*C*[b]	2	SE–N–NW	25–50
12	20	00				
12	21	00	*C*	2	SE–Z–NW	90
12	21	30	5*C*	2	ESE–Z–WNW	40–90–40
12	22	00	*Cs*[c]	3	All sky	0–90–0
12	22	15	*Cs*	3	N sky	
			Ss	2	S sky	
12	22	30	*Cs*	3	N sky	
			Ss	2	S sky	
12	23	00	*O*			
12	23	30	2*C*	2	SE–S–NW	40,60
12	23	45				
13	0	10	*C*[d]	3	ESE–NW	50
13	0	40	*A*	2	SE–W	15
			Ss	1	ENE,N,NW	
13	1	15	*A*	2	SE–W	15
			Ss	2	NE,N,NW	10–30
13	1	45	*A*	2	SE–W	15
			C	2	E–Z–W	90
			Ss	2	NE–N–NW	10–30
13	2	15	*A*	2	SE,S,W	30
			Ss	2	N sky	
13	2	45	*O*			
13	3	50	*Cs*	2	SW–N	
16	2	05	*Ss*	2	E–NW	0–90
16	23	50	*A*	1	E–Z–W	90
			G	2	WNW	20
17	0	15	*G*	2	NE,N	0,90
17	0	45	*G*	2	NE,N	0,90
17	1	10	*O*			

Date	L M T		Form	Intensity	Position	Altitude
1922	*h*	*m*				°
Oct 17	19	00	*G*	1	NE	
17	19	30	*A*	3	E–NNW	25
			C, *Ss*	2	E–NNW	ca40
17	19	40	*A*	2	E–NNW	25
17	20	30	*A*	1	E–NNW	25
17	21	00	*A*	3	E–NNW	
17	21	30	3*A*	2	E–N–NW	20,30,40
			A	2	E–S–WSW	60
18	21	00	*O*			
19	19	00—	*O*			
19	22	00				
20	0	00—	*O*			
20	2	00				
20	3	00	*C*	2	E–Z–W	90
20	3	30	*C*	2	E–Z–W	90
20	4	05	*A*	1	SE–S–NW	80
			Ss	2	N sky	
20	4	15—	*O*			
	5	00				
20	19	15	*G*	2	ENE	30
20	19	30	*A*	2	E–NNW	40
			G	2	E	Low
20	20	25	*C*	1	NE–NW	40
			G	2	E	
20	21	10	2*A*	2	ENE–WSW	40,60
			G	2	NNE	
20	21	30	2*A*	1	ENE–WSW	40,60
20	22	00	*A*	2	E–Z–W	90
			2*A*	2	ENE–WSW	40,60
20	22	30	*A*	3	E–Z–W	90
20	23	00	*G*	2	SE	30
23	3	45	*A*	2	E–Z–W	90
			G	2	N–NW	20
23	4	00	*A*	1	ESE–Z–WNW	90
			G	1	NW	15
23	4	30	*G*	1	NW	
23	5	00	*O*			
23	22	00	*O*			
24	1	00	*G*	1	W,NNW	30
24	2	00	*G*	1	NNW	20
24	19	30	*A*	2	E–NW	35
24	21	00	*A*	2	E–Z–NW	90
			C	2	E–N–NW	70
24	22	30	*A*	1	E–S–W	30
24	23	00	*O*			
24	23	55	*C*[e]	3	E–Z–W	90
25	0	30	*C*	3	E–Z–W	20
			Ss	2	NW	20
25	1	00	*G*	2	Z	20
			Ss	2	NW	
25	1	30	*G*	2	Z	90
			Ss	2	NW	
25	2	00	*A*	1	E–Z–WNW	90
			Ss	2	NE	
25	2	00—	*O*			
25	4	00				
25	4	30	*G*	2	E	20
25	22	30	*C*	1	E–Z–WNW	90
25	23	00	2*C*[f]	3	E–S–WNW	70,80
			2*C*[f]	3	E–N–WNW	ca80
25	23	30	*Cs*[g]	3	All sky	
26	0	15	*Cs*	3	SSE–E–NW	ca80
			C	2	ESE–Z	0–90
26	0	30	*Ss*	2	W,SW sky	
			Ss	4	N,E sky	

[a] Very weak, radiation-point 15° below δ Ursae Majoris, uncertain observation [b] Lower rim red, rapidly moving [c] Lower rims red, rapidly moving [d] Strongly yellow in NW [e] Lower rim red [f] Of a yellow-green color [g] In several places forming spirals with bright center, color white-green



AURORAL TYPES PHOTOGRAPHED OFF NORTH COAST OF SIBERIA, 1918-1924

1 Middle part of arch, curtain below
5 Curtains

2 Lower part of broad arch
6 Curtain photographed 4 minutes later than Fig 7

3 Rapidly moving curtain
7 Curtain photographed 2 minutes later than Fig 8

4 Arch tending to moving curtains
8 First of 3 photographs (Figs 6, 7, and 8) showing rapid changes in curtain

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1922	h m				°
Oct 26	1 00	*A*	2	SE–S–SW	ca50
26	1 20	*C* *A*	3 2	NE–N–W SE–S–SW	ca80 50
26	2 00	*Cs*, *G*	3	All sky	
26	3 00	3*A*	1	E–Z–W	90
26	4 00	*Ss*	1	E, Z	
26	4 30	2*A*	2	NE–S–SW	35–40
26	5 00	*C* *Ss*	2 1	E–N–NW S	50
26	5 15	*O*			
26	5 30	*C* *G*	2 2	W–Z N	0–90 25
26	6 00	*O*			
26	6 30	*C*	2	Z	90
26	17 00– 21 50	*O*			
26	21 50	*C*[h]	2	E–NE	35
26	22 05	*S*	2	NE	
26	22 10	*O*			
27	0 00	*O*			
27	1 00	*A*	1	E–Z–W	90
29	4 00	*G*	1	NW	10
Nov 4	2 00	*O*			
4	2 15	*C*	2	SE–N	25
4	2 30	*G*	1	N	40
4	3 00	*O*			
4	4 00	*O*			
4	4 15	*G*	2	E, Z	
4	4 30	3*C*	2	ESE–Z–WNW	80, 90, 80
4	5 00	3*C*	1	ESE–Z–WNW	80, 90, 80
4	5 30	*G*	2	N	45
4	6 00	*A*	1	SE–W	60
4	6 15	*C*	1	Z	90
4	6 30	*O*			
4	7 00	*O*			
4 4	18 00– 18 30	*O*			
5 5	18 00– 22 00	*O*			
5	22 45	*G*	2	NNE	25
6	0 00	*O*			
6	1 15	*O*			
6	1 45	*Ss*	1	N–Z	0–90
6 7	22 00– 0 00	*O*			
9	17 30	*O*			
10 10	1 00– 2 00	*S*[i], *G*	2	W	0–60
10	2 15	*G*	1	W	30
10	2 30	*O*			
10	16 45	*G*	2	NE–N	ca10
10	19 30	*A*	2	E–NNW	15
10	19 55	*A*[i]	1	E–Z–NNW	10, 90, 10
10	20 10	*A*[i], *C*	2	ENE–NNW	ca15–60
10	21 00	*As*	2	ENE–NNW	
10	22 00	*C*[i]	2	E–Z–WNW	90
10	22 30	*C*[i]	3	E–Z–W	90
10	23 00	*G*	1	E	
11	0 00	*G*	1	E	
11	0 30	3*A*	1	ENE–NW	25
11	0 45	*A*	1	ENE–NW	25
11	1 00	*A*	1	ENE–NW	25
11	1 50	3*A* 2*A*	2 2	ENE–NW E–Z–W	45 90
11	3 00	*O*			

Date	L M T	Form	Intensity	Position	Altitude
1922	h m				°
Nov 11	4 15	*A* *G*	1 1	E–Z–W N	90 40
11	4 30	*O*			
11	6 00	*O*			
11	6 25	*As*	2	ENE–WNW	0–60
11	7 00	*G*	2	N	
11	23 45	*A*	1	N–NW–W	8
12 12 12	0 00 4 00– 6 00	*O*			
13	18 00	*O*			
13	21 00	*A*	1	ENE–WNW	20
13	22 00	*A*	2	E–N–W	45
13	22 20	*A* *A*	2 2	E–N–W E–Z	45
13	23 00	*Ss*	1	E–Z	0–90
13 13	23 15– 23 30	*O*			
13	23 45	*C*	2	NE–SW	35
13	23 55	*G*	2	NNW	15
14	0 00	*C*	2	E–NW	60
14	1 00	*C*	2	E–NW	60
14 14	1 00– 2 00	*O*			
15	18 30	*O*			
15	22 00	*A*	1	NE–NW	30
15	22 30	*A*	1	NE–NW	30
15	23 00	*O*			
16	1 00	*G*	2	Z	90
16	2 00	2*C*	2	Z	90
16	3 00	*O*			
16	4 00	*O*			
16	17 30	*O*			
16	21 20	*C*	2	E–WNW	80
16	21 25	*A*	2	E–WNW	80
16	21 30	*Ss*	2	E, NW	
16	22 00	*Ss*, *G*	2	E–NW	
16	22 30	*A*	4	E–Z–W	90
17	0 30	*A*	2	ESE–Z–W	90
17	0 45	*A*	2	ESE–Z–W	90
17	1 00	*O*			
17	2 00	*Ss*	2	WNW	0–90
17	2 30	*Ss*	2	WNW	0–90
17 17	3 00– 6 00	*O*			
17	17 20	*O*			
17	20 00	*A*	2	E–NW	25
17	22 00	*G*	2	N	10
17	23 30	*A*	2	E–N–W	20
17	23 55	2*A* *G*	2 2	E–Z–W ENE	90, 80 15
18	0 30	*C* *G*	2 2	ESE–Z–W ENE	90 ca10
18	1 05	*A* *G*	3 2	ESE–W NE	80
18	1 30	*A* *S*[i]	3 2	ESE–W NW–Z	80 0–90
18	2 00	*A* *C*	2 2	ESE–W NE–NW	80 45
18	2 30	*C*	2	E–N	80
18	2 35	*Ss*	2	NW–Z	0–90
18	2 45	*A*	1	E–N	ca45
18	3 00	*A* *A*	2 2	SE–S–W E–N–W	50 30
18	3 30	*A*	2	SE–S–W	30

[h] The curtain rises above the east horizon like a torch to 15°, continues rising, spreading towards NE

[i] Lower rim red, upper green

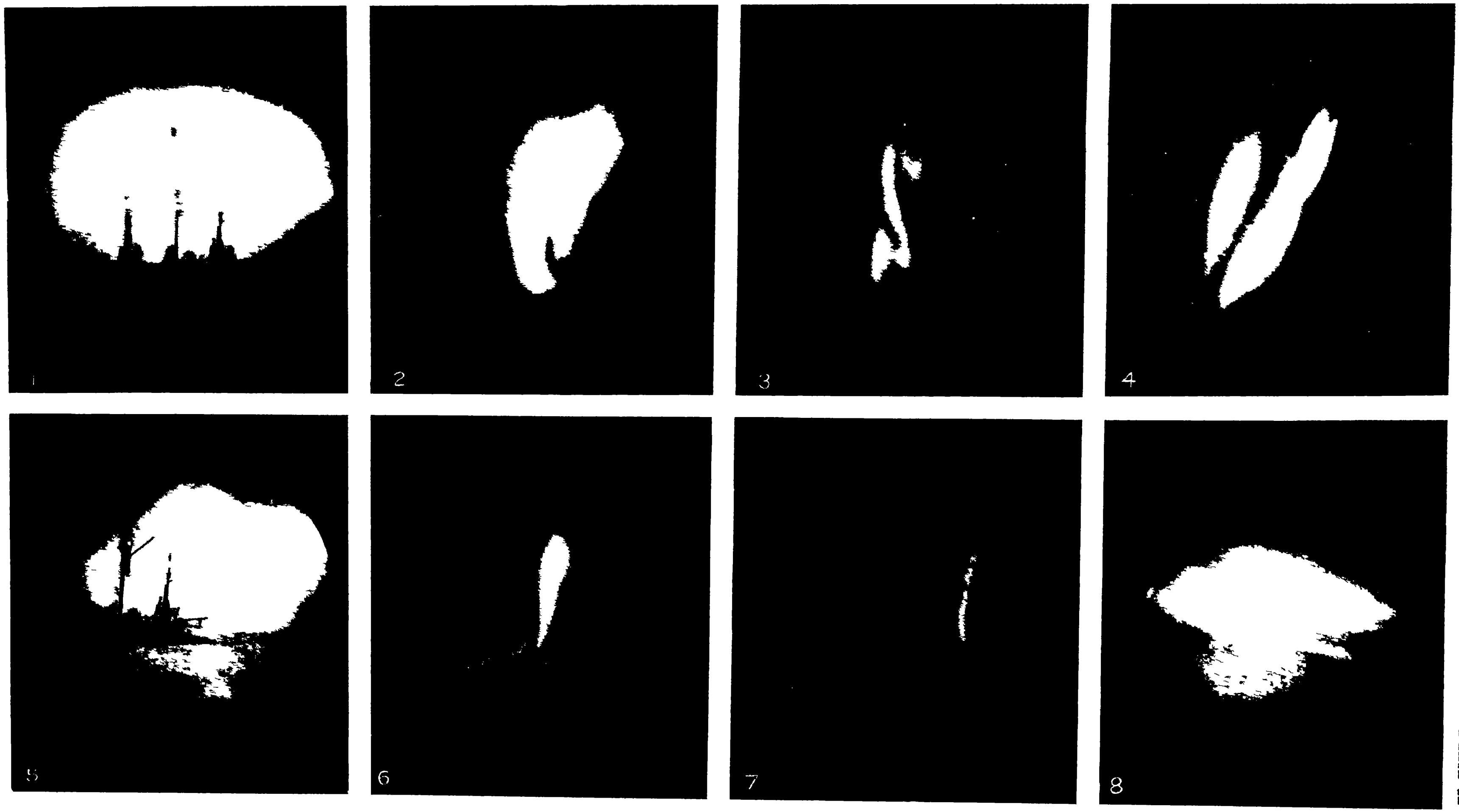
TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1922	*h m*				°
Nov 18	3 45	*Ss*	2	W–Z–E	0–90
18	4 00	*G*	1	N sky	
		Ss	2	W–Z–E	0–90
18	5 00	*Ss*	2	W–Z	0–90
18	6 00	*G*	2	W	
18	18 30	*O*			
18	21 25	*C*	3	E–WNW	80
		C	2	NE	30
18	21 40	*C*	3	ENE–WNW	60
		G	2	Z	90
18	22 00	*Cs*[j]	3	E–N–W	ca80
18	22 30	*Cs*	2	E–N–W	
18	23 00–	*G*	2	NE–NW	0–45
18	23 30				
19	0 00	*Cs*	3	ENE	
19	0 30	*A*	2	SE–S–NW	45
		Cs	2	NE–NW	70
19	1 00	*A*	2	SE–S–NW	45
		Cs	2	NE–NW	70
19	1 30	*A*	2	E–S–W	30
		C	2	N sky	15
19	2 00	*A*	1	E–S–W	30
19	3 15	*Ss*	2	S–W	ca45
19	4 25	*Ss*	1	E	0–70
		G	2	NNE	
		A	1	ENE–WSW	ca85
19	6 00	*G*	1	ENE	ca30
19	17 00–	*O*			
19	18 00				
19	21 00	*A*[k]	1	ENE–NE	ca30
19	22 00	*Cs*	2	E–Z–WNW	90
19	22 30	*A*	2	E–Z–W	90
		Cs	2	E–NW	ca45
19	23 00	*A*	2	E–Z–W	90
		Cs	2	E–NW	45
19	23 30	*C*	2	E–Z–NW	90
20	0 00	*C*	2	E–Z–NW	90
20	1 00	*Ss*	2	E–W	45
20	2 15	2*A*	2	E–W	60,70
		C	2	NNE–Z	
		G	2	WNW	40,55
20	3 15	2*A*	1	E–W	60,70
		C	1	NNE–Z	
		G	1	WNW	40,55
20	4 00	*G*	1	N	0–45
20	4 30	*G*	1	N	0–45
20	5 00	*C*	2	E–Z–W	90
		Ss	2	E	20
20	5 30	*C*	2	E–Z–WNW	90
		G	1	N	
20	6 00	*G*	1	N,Z	
20	6 30	*As*	1	ENE–N–W	
		Ss	2	NW	
20	18 00–	*O*			
20	22 00				
20	23 00	*A*	2	E–Z–W	90
21	0 00–	*O*			
21	2 00				
21	2 15	*G*	2	E	20
21	2 45	*G*	2	E	
21	3 00–	*O*			
21	4 00				
21	22 00	*G*	2	N,NNE	30
22	1 30–	*O*			
22	2 00				
22	3 15	2*A*	1	E–Z–W	90
		Ss	2	N–Z	
22	3 45	*Ss*	2	E–Z	

Date	L M T	Form	Intensity	Position	Altitude
1922	*h m*				°
Nov 22	4 15	*Ss*	1	N	
22	5 00	*O*			
22	5 35	*O*			
22	5 40	3*A*	2	E–Z–W	40,90
22	21 15	*A*	1	E–WNW	40
22	22 00	*O*			
23	0 15	*A*	2	E–Z–WNW	90
		Cs	2	ENE–NW	40
23	0 30	*A*	2	E–Z–WNW	90
		Cs	2	E–Z–NW	90
23	1 00	*A*	2	E–Z–NW	90
23	1 30	*A*	2	E–Z–NW	90
23	2 00	2*A*	2	ENE–N–NW	ca30
23	3 00	*A*	1	E–Z	
23	4 15	*G*	2	ENE	ca10
23	5 30	*Ss, G*	1	E,NNW	ca15
23	6 00	*A*	1	E–Z–W	90
		G	2	S,NNW	30
24	2 00	*G*	2	E,W	
24	4 15–	*O*			
24	6 00				
24	20 40	*A*	2	ENE–NW	15
24	22 00	*A*	2	N sky	25
24	23 00	*C*	3	NE–N	
25	0 05	*A*	2	E–Z–W	90
		C	2	ENE–NNW	30
		Ss	2	E–Z	
25	0 30	*A*	2	E–Z–W	90
		C	2	N–W	ca15
		G	2	NNE	25
25	0 45	*Ss, G*	1	E,NNW	ca40
25	1 00–	*O*			
25	2 00				
25	3 00	*G*	2	W	
25	3 45	*C*	2	E–NW	30
		G	2	W	
25	4 15	*G*	1	N–W	15
25	4 30–	*O*			
25	5 00				
25	5 30	*A*	1	ENE–NW	30
26	0 00–	*O*			
26	1 00				
26	1 30	*G*	2	NE	
26	2 00	*G*	2	E,NE	20
26	2 30	*A*	1	ENE–NW	20
26	3 00–	*O*			
26	4 00				
27	22 15	*A*	2	ENE–NW	10
		A	2	E–S–W	ca80
27	22 30	*A*	2	ENE–NW	10
		A	2	E–S–W	80
27	23 00	3*A*	2	E–Z–W	80,90,80
27	23 30	*A*	2	E–W	ca80
28	0 00	*Cs*	4	ENE–NW	45
28	1 00	*Cs*	1	NE	
28	2 00	*Cs*	1	NE	
28	2 30	*A*	1	NNE–W	25
28	3 00–	*O*			
28	5 30				
28	6 00	*A*	1	E–NW	50
28	6 10–	*As*	1	E–Z–W	30–90–40
28	6 30				
28	6 45	*Cs*	4	N,S sky	90
28	7 00	*Co*[l]			
		Ss	3	NW	
28	7 15	3*A*	1	E–Z–W	90
28	7 45	*A*	2	E–Z–W	90

[j] Rapidly moving, form for short time 4 closed ellipses around a point 5° east of Polaris [k] Appears as part of arch with maximum altitude in NE [l] Fragment of corona, radiation-point near β Ursae Majoris

Plate 12



Auroral Types Photographed off North Coast of Siberia, 1918-1924

1 Glow with western end of arch to right
2 Lower ends broad arches
3 Corkscrew-shaped curtains
4 Corkscrew-shaped curtain
5 Arch and glow
6 Curtain
7 Western ends arches
8 Curtains, elliptic form

HELIOTYPE CO BOSTON

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1922	*h m*				°
Nov 28	20 50	A^{m}	2	E–WNW	40
		Ss	2	N	ca5
28	22 00	*Cs*, *Ss*	1	NE, NW	ca45
29	16 30	*A*	1	N sky	ca15
29	21 35	*C*	2	E–SSW	20
29	21 45	*Cs*, A^{n}	3	All sky	
29	22 00	*O*			
29	22 15	*A*	1	E–S	15
29	22 30	C^{o}	2	E–N	15
		G	1	W	60
29	23 00	*O*			
29	23 30	*C*	2	N	20
29	23 45	*C*	2	E–Z	10–70
30	0 00–				
30	2 00	*Cs*, Ss^{p}	3	All sky	0–90
30	2 30	*Ss*	2	S sky	
30	3 00	*A*	1	NE–W	ca30
		Ss	2	S sky	
30	3 30	*A*	1	SE–S–SW	ca15
30	4 00	*Ss*	1	E, SE	
30	6 00	*G*	2	NE	
30	8 00	*O*			
Dec 2	4 00	*G*	1	NE	
2	6 00	*G*	1	NE	
3	1 50	*G*	1	W sky	
5	22 00	*Cs*, *Ss*	2	E, N sky	
5	23 00	*Cs*, *Ss*	2	E, N sky	
		A	1	E–Z–W	90
6	0 45	*G*	2	SW	
6	2 00–				
6	6 00	*O*			
8	22 00	*C*	1	NE	ca10
8	22 30	*Cs*	3	E–NW	45–60
8	23 00	*Cs*	3	E–NW	45–60
8	23 00–				
9	0 00	*Cs*	2	E–NW	45–60
9	0 30	*Cs*	2	NE–NW	ca45
		Ss	2	E	
9	1 00	*Cs*	2	NE–NW	ca45
		Ss	2	E	
9	1 30	*Ss*	2	N sky	
9	2 00	*O*			
9	22 00	*O*			
11	7 30	*G*	2	NW	
11	16 00	*G*	1	ENE	ca10
11	17 00	*O*			
11	20 00	*A*	3	E–WNW	ca30
11	21 30	$2A^{q}$	2	E–N–WNW	30, 80
		Ss	2	NE	
11	22 00	*C*	1	NE–N	60
11	22 20	*G*	2	W	ca20
		Ss	1	E–Z	
11	23 30	*G*	1	NNE	30
12	0 00–				
12	8 00	*O*			
13	4 45	C^{r}	2	NE	60
14	0 00	*G*	1	N sky	
14	2 00–				
14	8 00	*O*			
14	22 00	*A*, *Cs*	3	E–Z–W	90
14	23 30	*Cs*	2	E, N	
15	0 00	*A*, *Cs*	2	S sky	30
15	0 30	*G*	2	All sky	
		A	2	E–Z–W	90
		C	2	NE–N	ca20

Date	L M T	Form	Intensity	Position	Altitude
1922	*h m*				°
Dec 15	1 00	*A*	2	NE–SSW	ca80
		G	2	SE, W	40, 50
15	1 30	*Ss*	2	E	
15	2 00–				
15	6 00	*O*			
15	22 00	*A*	1	E–S–W	ca30
		G	2	NNE	ca20
		A	2	ENE–N	ca50
15	22 30	*C*	2	E–S	ca70
15	23 30	*A*	1	SSE–WNW	ca85
		C	1	W	ca45
16	0 00	*G*	1	E	ca40
16	0 00–				
16	2 00	Cs^{s}	2	N sky	0–90
16	2 30	*Cs*, *Ss*	2	W, NW	0–90
		A	2	S–WNW	ca20
16	3 00	*A*	2	30°SE–Z–W	90
16	3 30	*A*	2	30°SE–Z–W	90
16	4 00	*C*	2	NW	ca45
		Ss	2	SE	20
16	6 00	*G*	2	E, W	
16	22 00	*O*			
16	22 30	*A*	2	ENE–WNW	30
16	23 00	*A*	1	ENE–WNW	30
17	0 00	*A*	1	ENE–WNW	30
17	0 30	*A*	1	ENE–W	30
17	1 00	*O*			
17	2 00	*C*	2	NE	0–30
17	3 00–				
17	5 00	*O*			
17	6 00	*G*	1	NW	
17	22 00	*A*	2	E–N	10
17	22 30	*A*	2	E–N	10
17	23 00	*A*	2	E–NW	ca15
18	0 00	*G*	1	E, N	
18	0 45	*A*, *Cs*	1	E, N	ca15
18	1 40	*Ss*	2	NE–Z	0–90
18	2 10	*A*	2	E–Z–W	90
		A	2	E–S–W	85
		G	2	NE	20, 35
18	3 00	*A*	2	E–Z–W	90
		A	2	E–S–W	85
		G	2	NE	20, 35
18	3 30	*A*	1	E–Z–W	90
		G	1	NW	30
18	4 00	*G*	2	N	
18	4 30	*Cs*	1	NE–NW	ca30
18	5 00	*Cs*	1	NE–NW	
18	6 00	*G*	1	NNE	20
18	22 00	*A*	2	N sky	20
18	23 00				
19	0 00	*O*			
19	1 00				
19	2 00	*C*	3	ENE–WNW	30
19	3 00–				
19	4 00	*Ss*	1	E, W	20
19	4 30	*A*	1	E–Z–W	90
19	5 00–				
19	6 00	*A*	1	E–Z–W	90
20	2 00–				
20	4 00	*O*			
21	0 00–				
21	2 00	*G*	1	N sky	
21	3 00	*O*			
23	0 15	*A*	2	E–Z–W	90

[m] Reddish [n] Rapidly moving curtains colored red, yellow, or green [o] Lower rim red [p] Very varying, frequently reddish curtains [q] On the lower arch are bright, glowing spots moving rapidly from W toward E [r] Visible 3 minutes only [s] The curtains were generally directed E–W but at $1^{h}\,30^{m}$ one was going in slings from the north horizon to zenith

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Inten-sity	Position	Altitude
1922	*h m*				°
Dec 23	0 45	*A*	2	E–Z–W	90
		G	2	NE	25
23	1 30	*C*	2	ENE–NNW	50
		A	2	E–S–W	ca60
23	2 00	*G*	1	NE	
23	3 00	*C*	1	NE–WNW	45
23	3 30–	*C*	1	NE–WNW	45
23	4 00				
23	4 30	*C*	1	NE–WNW	45
23	5 00	*O*			
23	22 00	*O*			
23	23 45	2*A*	2	E–N–W	40,80
24	0 00–	*C*	1	ENE–NNW	30
24	2 00				
24	2 30	*C*	1	ENE–NNW	30
24	3 00	*A*	1	NE–NW	15
24	3 30	*C*	1	NW	20
24	4 00	*O*			
24	20 00–	*O*			
24	23 00				
24	23 30	*G, Ss*	1	NE	20
25	0 00	*A*	2	ENE–N–WNW	35
25	0 30	*A*	2	ENE–WNW	35
25	1 00	*Cs*	2	ENE–WNW	20
		Ss	2	E	60
25	1 30	*C*	1	ENE–WNW	20
		Ss	1	E–Z–W	
25	2 00	*Ss*	1	ENE	0–60
25	3 30	*A*	1	N	
25	20 00–	*O*			
25	21 00				
25	21 30	*A*	1	ENE–NW	25
25	22 00	*A*	2	E–S–SSW40°	ca60
		3*A*	2	E–N–WNW	30–60
25	22 30	*A*	2	E–S–SSW40°	60
		3*A*	2	E–N–WNW	30–60
25	23 00	*A*	1	NNE	15
26	0 00	*O*			
26	1 00–	*O*			
26	6 00				
27	1 55	*A*	2	NE–Z–SW	90
		G	2	S sky	
27	2 30	*C*	2	E–Z–W	90
27	3 00	*Cs*	2	ESE–Z–WNW	60,90,60
27	4 00	*G*	1	E	60
27	22 00	*O*			
27	23 00	*G*	1	NE–NW	ca20
27	23 30	*A*	1	NE–NW	ca20
28	0 00	*A*	1	NE–NW	ca20
		C	2	E–Z–W	90
28	0 30	Cs^t	3	E–Z–W	90
28	1 00	*Cs*	3	E–Z–W	90
		Ss	2	SE–Z	0–90
28	1 30	*A*	2	E–Z–W	90
		C	1	S sky	
28	2 00	Cs^u	3	E–Z–W	70,90,70
28	2 30	*C*	2	E–N–W	80
		A	2	E–S–W	60
28	3 00	*A*	2	E–N–W	25
		G	2	NW	20
28	3 30	*O*			
28	4 00	*A*	1	E–Z–W	90
28	5 00–	*O*			
28	8 00				

Date	L M T	Form	Inten-sity	Position	Altitude
1922	*h m*				°
Dec 29	17 00–	*O*			
29	21 00				
29	22 00	*A*	1	ENE–WNW	25
29	22 30	A^v	1	ENE–WNW	50
		A	1	E–Z–W	90
29	23 00	*G*	1	NE–NW	10–30
30	0 00	*C*	2	NE–N	7
		G	1	NW	
30	1 00	*Cs*	1	Near Zenith	90
30	2 00	*Cs*	1	E, N	
30	2 30	*G*	2	NE–N, NW	
30	3 00	*O*			
30	4 00–	*O*			
30	6 00				
30	7 00	*A*	1	E–Z–W	90
30	16 00	*A*	2	ENE–WNW	30
30	17 00	*A*	2	ENE–WNW	30
30	18 30	Cs^w	1	E–WNW	10–90
30	21 00	As^x	2	E–WNW	
30	22 00	*A*	2	ENE–WNW	
		C	2	NW	30
30	22 30	A^w	1	ENE–NW	20
31	16 00–	*O*			
31	22 00				
31	22 30	*A*	2	ENE–WNW	40
		C^y	2	NW	30
		G	2	NE	30
31	23 00	*A*	1	NE–NW	20
31	23 20	*A*	1	NNE–NNW	10
1923					
Jan 1	0 40–	*O*			
1	8 00				
1	22 00–	*O*			
2	8 00				
2	22 00	*A*	1	NE–N	30
2	22 30–	*O*			
2	24 00				
3	1 00	*O*			
3	3 00	*Cs*	2	NW–N	ca60
		C	2	E–Z	0–90
3	3 30–	*O*			
3	8 00				
3	22 00–	*O*			
3	24 00				
4	0 30	*A*	1	E–S–W	ca80
4	1 00	*O*			
4	1 50	*C*	1	E–N	ca40
4	2 00–	*O*			
4	8 00				
7	4 00–	*O*			
7	6 00				
9	0 00–	*O*			
9	2 00				
9	23 30	*G*	2	NW	20
10	0 30	*Ss*	2	E–Z–W15°	90
10	1 00	*A*	1	NE–NW	20
10	1 30–	*O*			
10	2 00				
10	3 00	*G*	1	N sky	
10	4 05	*Cs*	1	Z–W	90
10	6 00	*O*			
10	22 00–	*O*			
11	1 00				
11	2 00	*G*	2	Z	90

[t] Very rapidly changing, slings are moving slowly in east and west but are whirling around near zenith, lower rim deep red, color changing through yellow to green [u] Of very white color [v] Very broad, in ENE the arch approaches a curtain in appearance, lower rim red [w] Lower rim red [x] In NW a glow which is narrowed to an arch toward east [y] Lower rim red, higher up of a brownish-yellow color

TABLE 64.—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Jan 11	3 00	C	2	E-N-W	55
		3A	1	E-Z-W	90,80,70
11	4 00	C	2	ESE-Z-NNW	90
		G	2	W	
11	4 30	2C	1	ENE-WNW	30
11	5 00	G	2	WNW	20
11	5 30	C	2	ENE-WNW	30
11	6 00	C	2	ESE-S-W	40
		G	2	ENE	20
11	6 20	G	2	All sky	
		C[aa]	3	All sky	
11	6 30	G	1	NW,E	
11	7 00	7A	2	E-Z-W	10–90–75
11	7 30	7A	2	E-Z-W	10–90–75
11	8 00	7A	2	E-Z-W	10–90–75
11	22 00	Cs	2	E,W,N	
11	23 00	Cs	2	E-Z-W	
12	0 00	Cs	2	E-W	
		A	2	E-Z-W	90
12	0 15	C[bb]	2	E-Z-W	90
		A	2	E-WSW	25
12	1 00	G	2	ESE,N,W	
12	1 30	G	2	W	
		C	2	NW-N	30
12	2 00	2A	2	E-N-W	40
12	2 30	G	1	E	ca20
12	3 00	3C	2	ENE-WNW	20,25,35
12	3 30	G	1	E,W	
12	4 30	G	1	E-SW	
12	5 00	O			
12	6 00	O			
12	22 00	O			
12	22 30	4A	2	E-Z-W	60,90,80
		G	2	NNW	
12	23 00	4A	2	E-Z-W	60,90,80
		G	2	NNW	
12	23 30	C	2	E-NW	ca60
13	0 00	C	2	E-NW	ca60
13	0 30–	Cs, Ss[cc]	2	All sky	
13	2 00				
13	3 00	A	1	ENE-Z-WSW	90
		2C	2	N	ca30
13	4 00	2A	2	ENE-Z-WSW	75,90
13	6 00	O			
13	18 00	A	2	ENE-NW	30
13	22 00–	O			
14	0 00				
14	1 00	C	2	E-Z-SW	90
		C	2	E-Z-NW	90
14	1 30	A	1	E-SW	ca60
14	2 00	G	2	E,S	
		Cs	2	N-NW	5–80
14	3 00	Cs	1	NW	
14	4 15	Cs	2	NNE-NW	ca35
		A	2	NE-S	ca70
14	5 00	C	1	NE-Z	90
14	5 30	G	2	WSW,S	
14	5 55	G	2	SE,S,SW	
14	6 15	G, Co[dd]	2	All sky	
14	7 00	O			
14	22 00	C	2	NE-N-NW	ca20
		G	2	N sky	ca30–90
14	22 30	G	1	E-WNW	0–60
14	23 00	G	1	E-WNW	0–60

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Jan 15	0 00	G	1	NE-NW	ca30
15	1 00	Co[ee]	1	Near zenith	
15	2 00–	O			
15	2 50				
15	3 00	C	1	W-S	ca40
		Ss	1	E,NE	
15	4 00–	O			
15	6 00				
15	22 00	O			
15	23 00	Cs	2	E,NE	20
16	0 00	Cs	2	N	15
16	0 15	C	2	NE-N	ca40
16	0 30–	O			
16	1 00				
16	2 00	A	1	E-W	70
16	2 30	A	1	E-W	60
16	3 00–	O			
16	4 00				
17	3 45	A	2	E-Z-W	90
17	4 00	A	2	E-Z-W	90
17	22 00	A	1	ENE-WNW	30
17	22 30	A	1	ENE-WNW	30
17	23 00	G	1	ENE	25
17	23 30–	O			
18	0 00				
18	1 00	A	2	E-Z-WNW	90
18	1 30	A	2	E-Z-WNW	90
		C	2	N-WNW	30
18	2 00	Cs	2	NE-NW	20
18	4 30	G	1	N sky	
18	6 00	G	1	NE	
		A	1	NE-NW	ca40
18	7 00	O			
18	22 20	A	1	NE-NW	
20	2 00	A	1	E-Z-W	90
		G	2	N,NW	
20	2 30–	O			
20	4 00				
20	5 00	A	1	E-NW	30
21	0 00–	O			
21	4 00				
22	0 30	G	2	NE-W	ca15
22	1 00–	O			
22	2 00				
22	4 30	A	1	SE-S	ca25
22	6 00	C	2	NE-N	ca70
		A	2	ENE-Z-WSW	90
		Ss	1	E-Z	0–90
22	6 15	9A	2	E-Z-WSW	30–90–0
		C	3	ENE	
22	7 00	As	2	E-Z-WSW	0–90–0
22	7 30	O			
22	20 30	A	2	ESE-S-NW	30
		Ss	1	E	
22	22 15	2A	2	SE-Z-NW	90,40
22	22 30	A	2	SE-Z-NW	90
22	23 00	O			
22	23 30	G	1	E,N	ca60
23	2 00	G	1	Z,SW	
23	2 30	O			
23	3 00	A	1	SE-S-SW	ca40
23	18 00	A	1	NE-NW	20
23	18 30–	A	1	NE-NW	20
23	22 00				

[aa] Very varying, the curtains appear to develop from glowing bands in east 3 curtains, each 10° wide, over each other and surrounded by auroral glow [bb] Western part moving toward N [cc] Shifting curtains and streamers over the whole sky, the curtains form occasionally closed circles at various points of the sky [dd] Radiation-point $\delta = 63°$, $\alpha = 12^h\ 00^m$ (δ = declination, α = right ascension) [ee] Exact place of radiation-point not noted

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	LMT	Form	Intensity	Position	Altitude
1923	*h m*				°
Jan 23	22 15	A	1	NE–NW	20
		C, Ss	2	E	
23	22 45	3A	2	E–Z–WNW	30,90,45
		Cs	3	E	
23	23 10	Ss	1	E	
		A	1	E–Z–WNW	90
		C	1	N	10
23	23 40	Ss	1	E	
		Cs[ff]	1	ENE–WNW	
24	0 35	A	2	E–N–W	60
		C	2	NE–NNW	ca20
24	2 00	C	1	ENE–WNW	30
24	3 00	C	2	N	20
		A	2	ESE–WSW	30
24	4 00	A	2	ENE–WNW	30
24	4 15	G	1	S sky	ca20
		Ss	2	W–Z	0–90
		Cs	2	N	ca30
24	5 00	A	1	SE–S–W	ca80
		Ss	1	S sky	
24	6 00	A	1	SE–S–W	ca80
		Ss	1	S sky	
24	22 00	A	2	E–Z–W	90
		A	2	NE–NW	40
24	23 00	C	2	E–SW	ca55
		G	2	N	
25	0 00	C	2	N–Z	ca60
		G	2	NE	
25	0 30	A	2	ESE–S–WSW	ca70
		A	2	ENE–N–WNW	ca30
25	1 00	G	2	NE	
25	1 30	O			
25	2 00	A	2	NE–WNW	ca30
25	2 30	A	2	NE–WNW	ca30
		G	2	ESE–Z	0–90
25	3 00	O			
25	3 30	A	1	S sky	25
		Ss	2	E–Z	
25	4 00	A	2	E–Z–W	90
		Cs	2	N, NW	20
25	5 00	Ss	1	Near zenith	
25	6 00	2A	1	N, SW	
25	22 00	A	2	E–NW	30
25	22 30	A	1	E–NW	30
26	0 00–	O			
26	2 00				
30	2 00	C	1	ENE–NW	30
30	22 00	A	1	E–N–W	45
30	22 35	C[gg]	3	All sky	
30	23 00	C	1	NW	ca3
31	0 00	O			
Feb 3	22 00	3C	2	E–Z–NW	90
		C	2	E–N	10
3	22 30	O		..	
3	23 00	C	2	NE–W	ca35
3	23 30	C	2	NE–W	ca35
		A	2	W–Z	90
4	0 00	C	1	NE–W	ca35
		A	1	W–Z	90
4	1 00–	O			
4	6 00				
5	22 00	O			
5	23 00	A	1	E–Z–WSW	90
		C	2	NE–N	70

Date	LMT	Form	Intensity	Position	Altitude
1923	*h m*				°
Feb 6	0 00	C	2	E–WNW	40
6	1 00	Cs	2	ENE–NW	
		Ss	2	NE	20
6	2 00	C	2	ENE–WNW	30
6	2 30	Cs	2	E–N–W	30
6	3 00	C	2	45°E–Z–W	90
6	3 45	C, A	1	E–Z–W	60–90
6	4 00–	O			
6	5 00				
6	22 00–	O			
7	2 00				
9	2 00	G	2	E	5
		Ss	1	W	
9	4 00–	O			
9	6 00				
10	2 00	Cs, Ss[hh]	3	All sky	
10	2 30	Cs, Ss	3	All sky	
10	3 00	Ss	1	Z–W	90–0
		C	2	E	
10	3 30	O			
10	4 00	G	1	N	
11	22 00	A	2	E–N–W	10
		Cs	2	NE	5
11	22 30	A	2	E–N–W	10
11	23 00	O			
11	23 30	Ss	1	E, Z	0–90
12	0 00	C	1	NE	10
12	1 00	C	1	NW	15
12	2 45	A	1	NE–Z–W	90
		C	1	N–WNW	40
12	3 00–	O			
12	3 30				
12	3 40	Ss	1	E–Z	
12	4 00	A	2	E–Z–W	90
12	4 30	As	2	E–Z–W	60–90–60
12	5 00–	O			
12	6 00				
12	22 00	Cs	1	N	30
13	0 30	G	2	N sky	
13	1 00	A	1	E–Z–W	90
13	1 30	A	1	E–Z–W	90
13	2 00	3A	2	E–S–W	85,80,70
13	2 30–	O			
13	6 00				
14	0 30	C[ii]	3	E–WNW	45
14	1 00	2C	3	E–N–WNW	30,60
14	1 30	O			
14	2 00	A	2	E–Z–NW	90
15	22 00	A	2	E–N–W	35
15	23 00	A	2	E–N–W	35
		2C	2	NW	10
16	0 00	Cs	2	E–Z–W30°	90
17	0 20	2A	2	E–S–W	75,60
17	1 00	C	2	NW–W	ca85
17	1 30	Ss	2	N	
17	2 00	C	2	NNE–N	70
		G	1	All sky	
17	2 30	C	2	E–S–WNW	40
17	3 00	C	2	E–S–WNW	40
17	3 30	C	3	E–Z–W	90
		C	2	E–S–WNW	40
17	4 30	A	2	E–S–W	30
17	5 00	A	2	E–S–W	45
		Ss	2	NW–Z	

[ff] The curtains form for a while an ellipse with horizontal axis extended over 30° lying between 7° and 30° above the horizon [gg] A ring of aurora is suddenly formed near zenith, from which aurora spreads toward east and west in a few seconds For 5 minutes the sky is covered by vivid curtains and then the aurora disappears, except a weak arch [hh] Curtains and streamers all over the sky, radiating from point in Cancer color vivid green [ii] Color strong green

Table 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Feb 17	22 00	*Co*^{jj}	2	Z	
		C	3	NNE-NW	25
		Ss	1	SW	
17	22 30	*C*	3	ENE-N-WNW	85
17	23 00	*C*	2	ENE-N-WNW	85
		A	2	E-Z-W	90
17	23 30	*C*	2	N-W	10
18	0 00	*C*	2	E-Z-W	90
18	0 30	*C*	2	E-N-WNW	30
18	1 00	*C*	2	E-N-W	50
18	1 30	*C*	2	E-S-W	45
18	2 30	*C*	2	NW	
		G	2	E-S-W	ca60
18	3 00	*Cs*	2	NW,W	
18	3 30	*Cs*	2	NW,W	
18	4 00	*G,Ss*	2	N sky	
18	5 00	*G*	1	All sky	
18	6 00	*G*	1	All sky	
18	6 10	*A*	2	E-S-W	10
		G	2	S sky	10-70
19	0 30	*A*	2	E-Z-W	90
		Ss	2	NE	10
19	1 00	3*C*	2	E,NW	ca15
19	1 30	*O*			
19	2 00	2*C*	2	E	ca15
19	3 15	*A*	3	E-Z-W	90
20	22 00	*A*	1	N	25
20	22 40	*Cs*	4	E,Z	
21	0 00	*Cs*	3	N sky	
21	0 30	*G*	2	E	ca40
		A	1	N-NW	35
21	1 00	*G*	3	E-ESE	ca40
		A	2	N-NW	35
21	1 30	*A*	2	N-NW	35
21	2 00	*A*	2	E-S-W	ca80
21	2 30	*A*	2	E-S-W	ca80
21	3 00	*Cs*	2	E-S-W	ca60
21	4 30	*G*	2	S sky	
		2*C*	2	NW	
21	5 00	*Ss*	1	E,Z,W	
25	19 15	*C*	1	E-NW	45
25	19 45	*Co, Cs*^{kk}	1	SE-Z-NW	
25	22 00	*C*	2	E-S-SSW	ca70
25	22 30	*C*	2	NE-Z-SW	90
25	23 00–	*O*			
25	23 30				
26	0 00	*C*	2	NE-Z	
		G	2	N	ca50
26	0 30	*C*	2	E-S-W	70
		Ss	2	NE	ca10
26	1 00	*C**	1	E W	
		G	2	NE	
26	1 30	*Cs, Ss*	1	All sky	
26	1 50	*Co*^{ll}	1	Z	
26	2 00	*G*	2	N	
26	2 30	*A*	1	E-N-W	15
		A	1	E-S-W	10
26	3 00	*Cs*	2	SE,NW	
26	3 30	*O*			
26	18 00–	*Cs*^{mm}	2	All sky	
26	22 00				
26	23 00	*Cs*	2	All sky	
27	0 00	2*C*	2	E-N-WNW	20,30
27	1 20	2*A*	1	SE-S-W	30,10
27	2 00	*A*	2	SE-S-NW	30
1923	*h m*				°
Feb 27	4 25	*A*	1	NE-S-SSW	ca75
Mar 1	2 00–	*O*			
1	3 00				
1	3 15	*C*	1	E-N-W	
1	3 45	*A*	2	ESE-S-SSW	30
1	4 30	*A*	1	SE-S-SW	30
1	5 00	*O*			
1	22 00	3*A*	2	E-N-W	ca20
1	22 30	3*A*	2	E-N-W	ca20
1	23 00–	*O*			
1	23 30				
4	4 00–	*O*			
4	6 00				
4	22 00	*Cs*	1	Near zenith	
6	22 30	*C*	2	E-NNW	30
7	1 00	*C*	2	NW	ca20
9	23 30	*C*	2	NE-N-NW	50
		A	2	E-Z-W	90
10	2 00	*C*	2	E-Z-NNW	90
10	2 30	*Ss*	2	SE-Z-NW	90
		C	2	W	15
10	3 00	*O*			
11	1 00	2*C*	2	ENE-Z-NW	90
11	2 00	*C*	2	NE	
11	2 45	*Ss*	1	E-Z-W	90
11	22 00	*C*	2	E	ca30
11	23 00	*C*	2	E-Z-W	90
12	0 00	*C*	2	E-Z-W	90
		G	2	S	ca45
12	1 00	*C*	2	NW	ca10
12	3 00	2*A*	1	NE-N-WNW	50,60
12	23 00	*A*	1	E-Z-W	90
12	23 40	*A, Cs*	1	E-N-W	0-70
13	0 30	*C*	2	SE-S-W	70
13	1 00	*A*	1	NE-N-NNW	40
13	1 30	*O*			
13	22 00	*C*	2	E-N	25
13	22 30	*C*	2	E-N	25
13	23 00	*O*			
13	23 45	*C*	2	E-N-W	
		A	2	ENE-Z-W	90
14	0 00–	*Cs*	2	E-WNW	
14	1 00				
14	1 35	*Co*^{nn}	2		
14	22 00	*C*	2	E-N-WNW	40
14	23 00	*As*	3	E-WNW	
15	0 00	*G*	3	All sky	
		A	2	ESE-Z-WSW	90
		Cs	2	E-WNW	
15	0 30	*Cs*	2	ESE-Z-WNW	30-90-30
15	1 00	*C*	2	All sky	
15	1 30	*G*	1	S sky	
		C	2	ESE	15
		C	2	NE-N	10
15	2 00	*G*	1	S sky	
		C	2	ESE	15
		C	2	NE-N	10
15	22 00	*Cs*	3	E-Z-W	90
15	22 30–	*Cs*	3	E-Z-W	90
15	23 30				
16	0 00	*Cs*	3	E-Z-W	90
		A	2	E-S-SW	10
16	0 30	*C*	2	N sky	35
16	2 15	*A*	2	ESE-S-SSW	30
		G	2	N,NNE	

^{jj} Radiation-point $\delta = 63°$, $a = 120°$ ^{kk} The sky is from $19^h\ 15^m$, to $19^h\ 40^m$ covered with curtains moving generally from SE to NW, at $19^h\ 45^m$ develops a weak and variable corona with radiation-point $\delta = 61°$, $a = 4^h\ 40^m$ ^{ll} At $1^h\ 50^m$ corona with radiation-point $\delta = 57°$, $a = 12^h\ 50^m$ ^{mm} Curtains are frequently forming closed ellipses with axis E-W both on N and S sky ^{nn} Corona formed by closed curtains with center near Vega, $\delta = 39°$, $a = 18^h\ 35^m$ (Observation doubtful)

TABLE 64—*Observations of Aurora Borealis, September 1922 to March 1923*—Concluded

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Mar 16	3 00	*C*	2	NE, Z	
		G	2	SSW	
16	4 00–	*O*			
16	6 00				
16	22 00	5*C*	1	E–Z–W	40–90
17	0 00	*Cs*	1	All sky	
17	0 30	*Cs*	1	All sky	
17	1 00	*G*	2	NNE	30
		Ss	2	ESE	
17	2 00	*Cs*	1	E–W	
17	22 00	*C*	2	E–WNW	35
17	22 30–	*C*	2	E–WNW	35
17	23 00				
17	23 30	*C*	2	NE–NW	30
18	22 30	*C*	2	E–Z–WNW	90
18	23 00	*G*	2	NE	20
19	0 30	*A*	1	E–Z–W	90
19	1 00	*G*	2	N, NE	ca10
19	1 30–	*O*			
19	2 00				
19	22 00	*C*	2	E–S–W	45
		G	2	N sky	
19	22 30	*Cs*	2	E–N–NW	20
		Ss	2	E–Z	
19	23 00	*Cs*	2	E–N–NW	20
		Ss	2	E–Z	
19	23 30	*Cs*	2	E–N–WSW	15
		G	2	E–Z	
20	0 00	*Cs*	2	E–Z–W	
20	1 00	*G*	1	N sky	
20	4 00–	*O*			
20	6 00				
21	1 50	*C*	1	E–S–W	80
		G	2	NE	
21	2 00	*Ss*	2	NNW	30
21	2 30	*Ss*	2	NNW	30
21	3 00	*G*	2	NW	

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Mar 21	3 30	*G*	1	NW	
21	22 00	*C*	1	SE–S–SW	80
		A	2	ENE–N	60
22	0 00	*A*	2	E–Z–W	90
22	0 30	*G*	2	W	.
22	1 00–	*O*			
22	2 00				
22	22 00	*A*	2	E–N–WNW	60
22	22 30	*As*	2	E–Z–W	60–90
22	23 00	*As*	3	E–S–WSW	80
22	23 30	*As*	3	E–S–WSW	80
23	0 30	*C*	3	E–Z–W	90
23	1 00	*Cs*	2	E–N–W	
23	1 30	*C*	2	E–N–W	
23	23 00	*Cs*	2	E–W	80
23	23 30	*C*	2	E–Z–W	90
24	0 00	*C*	2	E–Z–W	90
24	1 00	*O*			
24	22 00	*Co*°°	2		
		C	2	E–Z	
25	0 00	*Co*, *Cs*	1	E–Z	.
25	0 30	*Cs*	2	E, NNE	
25	1 00	*G*	2	NNE	
25	1 10	*Co*ᵖᵖ	1	All sky	.
		Ss	1	All sky	
25	1 25	*Co*, *C*	2	ENE–Z–WSW	..
25	2 00–	*O*			
25	4 00				
25	22 00	*C*	1	ENE–N–WNW	70
26	22 00	*A*	2	SSE–S–SW	10
26	23 00	*A*	2	SSE–S–SW	10
		C	2	E–Z–W	90
26	23 30	*O*			
27	0 00	*C*	2	E	20
27	1 00	*G*	1	NE	25
27	22 00	*C*	2	E–Z–W	90
29	1 30	*A*	1	E–N–WNW	60

°° Radiation-point $\delta = 64°$, $\alpha = 10^h\ 10^m$ ᵖᵖ Weak but well defined, $\delta = 63°$, $\alpha = 11^h\ 0^m$

from southeast through zenith to northwest. If the arch did not pass through the zenith, the summit is indicated in the northern or the southern sky If *nothing else is noted, the arch has passed over the northern sky.* For example, *A*, 3, *E–WNW*, 50°, means a strong arch passing from east to west-northwest over the northern sky, the greatest altitude of the lower rim being 50°; an arch passing over the southern sky is indicated by inserting the letter *S* between the directions to the end, as, for instance, *SE–S–W* When a definite number of arches were observed, it was frequently found that they have the same end-points, but varying maximum altitudes, in such cases the altitude column contains several numbers, each referring to one arch At times some of the arches pass over the northern sky, one through zenith and some over the southern sky, the altitudes entered to the left of 90° refer, then, to the arches in the northern sky, the altitudes to the right of 90° to the arches in the southern sky. For example, 3*A*, 2, *E–W*, 70°, 90°, 80°, means three arches of moderate brightness from east to west, one over the northern sky at maximum altitude of 70° above horizon, one through zenith, and one over the southern sky at maximum altitude of 80° above horizon, *As*, 2, *E–W*, 10°, 90°, 10°, indicates that the whole sky from 10° above horizon in north to 10° above horizon in south was covered with arches of moderate brightness extending from east to west. The position of curtains is indicated in the same way as the position of glow or arch, depending upon the extension of the curtains. If several curtains pass through zenith and both

TABLE 65—*Cloudiness on Scale 0 to 10 and Geographic Position September 1922 to March 1923*

Date	Local mean time in hours						Observed geographic position				
	2	6	10	14	18	22	L M T	Lat north		Long east	
1922							h	°	′	°	′
Sep 26	1	10	8	10	2	10	10	73	00	186	00
27	3	8	8	7	8	8	10	73	00	185	16
28	5	3	0	0	1	4	12	73	01	184	50
29	3	4	10	7	10	10	12	72	59		
30	10	10	10	10	10	10					
Oct 1	10	7	10	10	10	7					
2	10	10	6	7	10	9	9	72	56	183	49
3	10	10	10	10	10	10					
4	10	10	10	10	10	10					
5	10	10	10	9	9	10	21	72	52 3	181	36
6	9	10	6	8	10	10	12	72	51		
7	10	10	10	6	10	10					
8	10	9	10	8	9	3	20	72	47 1	180	23
9	7	10	10	9	9	10					
11[a]	9	10	10	10	10	10					
12	10	7	9	2	1	10	19	72	40 8	179	43
13	0	1	1	10	10	10	12	72	42 0		
14	10	10	10	10	10	10					
15	10	10	9	9	10	8	20	72	52 0	178	00
16	10	10	5	3	10	10					
17	3	9	7	1	2	1	19	72	48 5	177	36
18	10	10	8	7	10	1					
19	10	10	10	9	3	8	19	72	51 4	177	14
20	7	8	8	8	3	2	19	72	57 8	177	10
21	10	10	8	10	10	10					
22	10	10	10	10	10	10					
23	10	1	10	10	1	0	19	73	04 9	176	33
24	3	9	4	5	2	3	18	73	05 4	176	19
25	2	2	2	1	10	10					
26	0	0	0	1	1	1	18	73	06 4	175	55
27	2	10	1	1	1	10	18	73	05 7	175	52
28	10	9	10	10	10	9					
29	10	10	10	10	10	10					
30	10	10	3	10	10	10					
31	10	10	8	10	10	10					
Nov 1	10	10	10	10	10	10					
2	10	10	9	10	10	10					
3	10	10	10	3	6	6	18	73	34 9	174	31
4	9	1	1	1	1	2	18	73	32 3	174	25
5	3	3	1	1	1	3	18	73	28 8	174	26
6	1	1	10	10	10	1					
7	1	1	10	10	10	10					
8	10	10	10	10	10	10					
9	10	10	10	10	2	8	18	73	21 1	174	16
10	2	1	10	2	2	2	17	73	15 0	174	28
11	0	0	1	2	2	8	18	73	13 8	174	28
12	10	2	10	10	10	10					
13	10	10	10	2	1	2	18	73	14 4	174	04
14	1	10	10	10	7	7	18	73	14 6	173	52
15	10	10	10	7	2	3	18	73	13 5	174	08
16	1	10	10	2	1	0	17	73	15 0	174	04
17	1	0	10	0	0	1	17	73	14 9	174	01
18	0	0	1	1	2	0	18	73	15 8	173	53
19	0	0	1	0	0	0	17	73	16 2	173	54
20	0	0	1	1	1	0					
21	0	10	10	10	6	0	20	73	12 5	173	41
22	10	0	10	10	5	1					
23	0	0	2	3	10	10					
24	0	2	1	2	1	0	17	73	11 8	173	50
25	0	0	10	10	1	10					
26	0	10	10	10	9	10					
27	10	10	2	0	0	0	9	73	12 8	173	40
28	0	0	2	1	0	0	16	73	13 5	173	39
29	10	10	5	2	0	0	16	73	14 8	173	32
30	0	2	1	1	0	0	16	73	14 4	173	32

[a] October 10 omitted because passed 180 meridian

TABLE 65—*Cloudiness on Scale 0 to 10 and Geographic Position September 1922 to March 1923*—Continued

Date		Local mean time in hours						Observed geographic position				
		2	6	10	14	18	22	L M T	Lat north		Long east	
								h	°	′	°	′
1922												
Dec	1	10	10	7	10	7	10					
	2	4	4	10	10	8	10	18	73	12 6	173	26
	3	3	3	2	10	10	10					
	4	10	2	10	10	10	10					
	5	10	10	10	1	1	1					
	6	0	0	1	2	4	10	9	73	12 6	173	57
	7	10	10	10	10	10	0					
	8	10	10	10	10	0	0	9	73	13 9	173	44
	9	0	0	10	10	0	1	18	73	13 0	173	34
	10	10	10	10	10	2	10					
	11	10	5	7	3	1	0	16	73	24 9	173	12
	12	5	0	0	0	0	10	16	73	28 3	173	05
	13	10	5	10	10	10	10					
	14	5	3	5	3	1	0	16	73	21 9	172	54
	15	5	5	10	10	10	5					
	16	2	9	1	2	1	0	9	73	27 8	172	19
	17	0	4	1	1	0	0	17	73	33 0	172	05
	18	0	0	1	0	0	0					
	19	4	1	2	1	1	10	15	73	31 6	172	08
	20	3	4	4	5	1	5					
	21	7	10	10	10	7	10					
	22	10	10	10	10	10	10					
	23	5	10	10	6	1	5	18	73	30 8	172	11
	24	0	0	1	1	0	0					
	25	0	5	5	2	2	4					
	26	2	2	10	10	10	10					
	27	5	6	10	10	8	0					
	28	0	1	6	4	10	10	18	73	26	171	53
	29	10	7	3	1	2	0	17	73	24 4	171	48
	30	0	0	3	2	0	1					
	31	10	10	5	3	3	0	16	73	24 6	171	44
1923												
Jan	1	1	0	10	1	0	7					
	2	0	0	1	0	0	0	15	73	25 2	171	39
	3	0	0	2	1	1	0					
	4	0	0	1	1	1	9	16	73	27 4	171	07
	5	10	9	10	3	3	10					
	6	10	8	6	5	3	10	9	73	33 4	170	24
	7	9	10	7	10	10	10					
	8	10	10	10	10	10	6					
	9	3	7	8	10	3	10	18	73	34 6	170	06
	10	5	5	10	10	2	10					
	11	0	2	1	1	0	0	16	73	34 2	170	11
	12	0	0	1	1	0	0					
	13	0	2	7	3	0	0	17	73	34 4	170	10
	14	0	0	1	0	0	0					
	15	0	0	1	3	1	2					
	16	4	10	10	10	10	10					
	17	10	6	8	10	1	1	17	73	35 7	169	38
	18	0	2	10	10	2	10					
	19	3	10	10	10	3	4					
	20	5	3	10	10	2	2	17	73	32 7	169	58
	21	3	4	10	10	3	2					
	22	3	3	2	2	1	1	17	73	38 8	170	51
	23	1	0	4	2	0	0					
	24	0	0	1	1	2	0	17	73	39 0	170	58
	25	0	2	1	1	0	2					
	26	10	10	2	8	7	10					
	27	1	10	2	8	5	10					
	28	10	10	9	1	7	10	18	73	42 0	171	25
	29	10	10	10	10	1	0					
	30	0	3	1	1	0	0	16	73	41 6	171	16
	31	0	0	1	1	0	0					
Feb	1	0	0	1	10	10	0					
	2	0	0	10	10	1	1	17	73	50 3	170	39
	3	0	10	5	2	2	1					

TABLE 65—*Cloudiness on Scale 0 to 10 and Geographic Position September 1922 to March 1923*—Concluded

Date	Local mean time in hours						Observed geographic position		
	2	6	10	14	18	22	L M T	Lat north	Long east
1923							h	° ′	° ′
Feb 4	1	3	7	1	4	8			
5	10	4	10	2	2	2	17	73 52 0	170 38
6	0	0	1	1	0	0			
7	3	5	4	10	2	10	17	73 53 8	170 40
8	4	5	2	2	2	10	17	73 54 2	170 49
9	0	1	1	1	1	0			
10	0	2	10	10	10	10			
11	10	10	6	9	8	7			
12	5	7	10	9	9	9	18	74 05 5	170 16
13	10	10	10	9	10	10			
14	0	9	10	10	10	10			
15	10	10	2	4	10	5			
16	10	10	10	10	0	0	20	74 03 5	170 10
17	0	0	2	1	0	0			
18	0	0	2	2	2	0			
19	0	0	2	9	2	10	20	74 12 7	169 55
20	10	10	10	10	0	0	18	74 16 9	169 59
21	0	0	2	2	10	10			
22	10	7	10	10	10	10			
23	10	10	10	10	10	10			
24	10	10	3	1	1	8			
25	10	4	0	0	0	0	20	74 05 4	170 06
26	0	1	2	0	0	0			
27	0	0	2	6	10	10			
28	10	10	8	10	10	10			
Mar 1	0	10	9	1	0	0	20	73 59 4	170 38
2	0	1	10	10	10	3			
3	2	2	2	1	0	1	20	74 00 6	170 47
4	10	1	2	2	1	1			
5	6	2	1	1	10	10			
6	10	5	10	0	1	0	19	74 01 9	170 28
7	3	10	2	10	9	10			
8	10	10	10	4	10	0	21	74 10 0	169 52
9	2	10	10	10	10	2			
10	1	5	0	10	10	2	16	74 08 6	170 13
11	0	0	0	0	2	0			
12	1	2	10	0	0	0	16	74 09 7	170 04
13	4	8	5	1	2	1			
14	0	2	1	0	0	0	16	74 10 2	169 51
15	0	0	0	0	0	0			
16	0	0	0	0	1	0	16	74 10 1	169 49
17	0	2	0	1	1	0			
18	0	10	0	1	1	1			
19	0	0	4	2	10	0	16	74 10 4	169 38
20	0	0	0	2	4	0			
21	0	10	5	2	10	9	16	74 11 7	169 46
22	10	10	10	10	1	1			
23	0	0	3	0	0	0	16	74 12 9	169 43
24	0	0	0	0	2	2			
25	2	8	10	10	10	10			
26	10	10	10	2	0	3	16	74 24 0	169 04
27	10	10	10	10	2	3			
28	1	3	0	0	1	0	16	74 26 6	168 56
29	0	10	1	1	9	10			
30	10	10	10	10	10	10			
31	10	10	10	9	10	10			

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*

Date	LMT		Form	Intensity	Position	Altitude
1923	*h*	*m*				°
Sep 26	22	00	*O*			
26	22	20	*Cs*	1	ESE–E	10
26	22	50	*Cs*	3	ESE–S–WSW	10–25
26	23	20	*O*			
27	21	05	*Cs*	1	NW	
27	21	45	*A*	1	S–WNW	25
28	0	00	*Cs*	2	ESE–S–WNW	30–90
28	1	00	*Co*[a]	2	N sky	
28	2	10	*A*	1	NE–Z–SW	90
28	2	30	*O*			
28	3	00	*O*			
28	3	35	*G*	1	NNE	
29	22	00	*A*	2	ESE–Z–WNW	90
29	23	00	*G*	1	All sky	
29	23	50	*A*	1	E–W	35
Oct 1	1	30	*Cs*	1	NNE–W	20
1	2	00	*Cs*	2	NNE–W	20
3	0	15	*Cs*	2	E–N	25
3	0	45	*Cs*	1	E–N	25
3	1	10	*G*	1	NW	15
3	1	35	*A*	1	ESE–WNW	30
3	1	55	*A*	1	ESE–WNW	30
3	2	30	*C*	1	ESE–WNW	
3	3	00	*O*			
3	3	30	*O*			
3	4	00	*O*			
3	20	00	*O*			
3	23	30	*G*	1	E sky	
4	1	00	*O*			
4	1	30	*O*			
4	2	00	*O*			
4	23	00	2*A*	1	E–Z–WNW	90
4	23	30	*A*	2	ENE–NW	40
5	0	00	*C*	2	ENE–NW	40
5	0	15	*A*	2	E–Z–W	90
			G	2	WNW	
5	0	40	*As*	1	E–Z–W	40–90–40
5	1	00	*As*	1	E–Z–W	40–90–40
5	1	20	*As*	2	E–S–W	90–0
			A	2	N	25
5	1	45	*Overcast*			
9	20	00	*Cs*	2	E–Z–W	90
9	20	35	*O*			
9	21	15	*O*			
9	22	00	*A*	1	NE–NNW	20
9	22	30	*A*	1	NE–NNW	20
			C	2	Near zenith	80
9	23	00	*A*	1	NE–NNW	20
			C	2	Near zenith	80
Oct 9	23	30	*O*			
10	0	00	*Cs*	1	60°NE–Z–S	90
10	20	00	*O*			
10	21	30	*O*			
10	22	00	*Cs*	1	E	
10	23	00	*Ss*	1	E–W	80
11	0	00	*Cs*[b]	3	S sky	90–0
11	0	20	*Cs*	3	S sky	90–0
11	0	40	*O*			
11	1	20	*C*	1	N sky	30
			A	1	E–Z–W	90
11	1	45	*O*			
11	2	25	*C*	1	E–S–W	30
			C	3	E–Z–W	90
			C	2	E–N–W	30
11	2	45	*C*	2	NE–N–NW	30
			C	1	E–Z–W	90
			C	2	SE–S–SW	30

Date	LMT		Form	Intensity	Position	Altitude
1923	*h*	*m*				°
Oct 11	3	15	*Ss*	2	E–Z	0–90
11	4	00	*O*			
11	23	00	*Cs*[c]	3	E–Z–W	90
11	23	30	*C*	1	S sky	20
			Cs	2	E–Z–W	90
			C	1	S sky	20
11	23	55	*C*	1	E–Z–W	90
12	1	30	*C*	2	NE–N	15
			C	2	NE–N	30
			G	2	Near zenith	
12	2	00	*G*	2	NE, Z	
12	22	10	*G*	2	Around horizon	20
			Ss	1	E, ENE–Z	0–90
12	2	35	*A*	2	ESE	30
			G	2	SW–W	
			C	3	NW	
			Ss	2	NW, W–Z	
12	3	00	*A*	2	ESE	30
			G	2	SW–W	
			Ss	2	NW, W–Z	
12	3	30	*G*	1	Around horizon	15–30
12	4	00	*O*			
12	18	30	*O*			
12	20	00	*C*	2	E–NNW	50
12	22	30	*G*	2	SE	
12	23	00	*As*	2	E–Z–W	60–90–60
			Cs	2	E–Z–W	60–90–60
12	23	30	*As*		All sky	
			Cs		All sky	
13	0	30	*As*	2	E–S–WNW	15
			Cs	2	NE–NW	
			Ss	2	NE, NW–Z	0–90
13	1	00	*A*	1	E–S–WNW	
13	1	30	*Cs*	2	N, NW	25, 30
16	22	00	*A*	2	ENE–WNW	50
16	22	30	*A*	2	ENE–WNW	
18	18	30	*C*	2	E–Z–W	90
18	19	30	*C*[d]	3	E–Z–W	90
			G	2	All sky	
18	20	15	*A*	3	SE–S–SW	20
			A	2	SE–S–SW	10
19	0	00	*G*	2	E	
19	0	30	*G*	2	E	
22	0	00	*A*	1	N	
22	4	00	*Ss*	2	NE	
22	4	30	*Ss*	2	NE	
29	3	30	*Cs*	2	W, WNW	10
29	4	00	*Cs*	2	W, WNW	10
31	18	00–	*O*			
31	22	00				
31	22	35	*Cs*	1	NNE	15
			Ss	2		
31	22	50	*C*	2	N–S	25
31	23	00	*Ss*[e]	2	Z	
			Cs	1	E	
31	23	30	*O*			
31	23	55	*C*	1	SSE–NNW	
Nov 1	0	10	*Co*[f]	4	SE–W–N	
			C	2	NW	
1	0	15	*C*	1	NW–N	
1	0	45	*C*	1	N	
1	1	10	*C*	1	N	10
1	1	30	*O*			
1	1	50	*C*	2	NW	15
			Ss	2	Z	
1	2	00	*Cs*	2	NW	15
			Ss	2	Z	

[a] Northern half of a corona, radiation-point not observed [b] Rapidly moving, vividly colored [c] Rapidly moving, the curtains in W aae intensely violet at lower rim [d] Lower rim red [e] Forming half of a corona, radiation-point not noted [f] Radiation-point $\delta = 66°$, $a = 2^h\ 20^m$, lower rims of curtains red

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Nov 1	16 00–	*O*			
1	23 00				
2	17 30	*C*	3	ESE–WNW	
2	18 00	*C*	2	Near zenith	
2	20 00	*C*	2	SE–Z–NW	90
3	18 00	*A*	2	E–NW	20
3	18 55	*C*	2	E–NW	15
3	20 00	3*C*	2	E–NW	10
3	21 45	*C*, *Co*[g]	2	ESE–S–WNW	30–90
3	22 00	*C*	3	E	30
3	23 00	*O*			
4	0 00	*C*	1	E	15
4	0 30	*C*	2	E	10
4	1 00	*O*			
4	1 30	*A*	1	N	10
4	2 00–	*O*			
4	4 00				
4	4 30	*O*			
4	5 00	*C*	1	E–N	15
4	5 30	*O*			
5	0 00	*G*	1		
5	0 30	*A*	1	S–NW	
5	1 00	*O*			
5	1 30	*O*			
5	2 00	*O*			
5	17 00–	*O*			
5	21 00				
5	22 00	*C*	2	NE–NW	
5	22 30	*C*	2	NE–NW	
5	23 00	*C*	2	NE–NW	
5	23 30	*C*	2	NE–NW	
6	0 00	*C*	2	NE–NW	
		G	2	NW	
6	0 30	*C*	3	E–NNW	15
6	1 00	*C*	2	NNW	10
		C	2	E	
6	1 30	*Cs*	1	E–NW	
		G	2	Z–W	90–60
6	2 00	*O*			
6	18 00–	*O*			
6	20 00				
6	22 00	*C*	2	E–NNW	15
6	22 30	*A*	1	SE–NW	30
6	23 00	2*A*	2	ESE–S–WNW	80
		A	2	ESE–N–WNW	80
6	23 30	*C*	3	SE–N–NW	35
7	0 00	*A*	3	SE–N–NW	35
		Cs	2	W–NW	ca45
7	1 00	*Cs*	2	E	45
7	2 00	*G*	2	Near zenith	
7	2 15	*A*	1	E–W	40
7	2 45	*A*	2	E–W	40
7	3 00	*A*	2	E–W	40
7	3 30	*A*	2	E–W	30
7	4 00	*A*	2	E–W	30
7	4 30	*A*	2	E–N–W	40
		A	2	E–S–W	50
7	5 00	*A*	2	E–N–W	40
		A	2	E–S–W	50
7	5 30	*O*			
7	6 00	*O*			
8	23 00	*A*	1	E–S–W	30
10	3 00	*A*	1	E	
10	4 10	*G*	2	All sky	0–90
10	4 30	*O*			
10	5 00	*O*			
1923	*h m*				°
Nov 10	20 00	*O*			
10	22 00	*O*			
11	0 40	*A*	2	E–Z–W	90
11	3 00	*Cs*	1	E–N–W	20
11	3 30	*Ss*	2	NE	
11	3 55	*O*			
12	1 30	*C*	1	E–N–W	35
12	2 00	*G*	2	N sky	
12	2 30–	*O*			
12	6 00				
13	5 45	*C*	2	N	30
		Co[h]	2	Near zenith	
13	6 00	*Ss*	2	N–Z	
		A	2	SE–WNW	30
13	18 00	*O*			
13	20 10	*A*	3	ESE–NW	45
13	21 10	*A*	2	ESE–Z–NW	90
13	22 00	*C*	3	ESE–S–WNW	50
13	22 30	*C*	3	ESE–Z–WNW	90
		C	2	ESE–S–WNW	
13	23 00	*As*, *Cs*	3	ESE–WNW	60
13	23 30	*As*, *Cs*	3	ESE–WNW	60
14	0 30	*Cs*	2	E–NW	45
		C	2	W, S	
		A	1	SE–W	20
		Ss	2	ESE	5–90
14	1 00	*Cs*	2	E–NW	30, 45
		A	1	SE–W	20
		Ss	2	ESE	5–90
14	2 00	*A*	1	E–S–W	25
		2*C*	2	NW	
14	4 00	*O*			
14	4 35–	*A*	1	E–S–WSW	30
14	5 00				
14	5 30	*G*	1	WNW	
14	17 00	*O*			
14	18 00	*O*			
14	19 30	*G*	1	Near zenith	90
14	21 00	*A*	3	ESE–NW	
14	22 00	*A*	1	E–N	15
		C	2	NW	20
14	22 30	*G*	1	ESE–NW	15
14	23 00	*G*	1	ESE–NW	15
15	0 00	*G*	1	ESE–NW	15
15	2 00	*A*	1	NE–N	20
15	2 15	*G*	1		
		Ss	2	WNW	
15	3 00	*Ss*	2	WNW	
15	3 15	*O*			
15	4 00–	*G*	1	NW	
15	4 15				
15	22 30	*Cs*	1	N sky	0–90
16	23 50	*G*	2	N sky	
17	0 30	*Ss*	3	Near zenith	
		A	2	SSW–NNW	50
17	1 00	*C*	3	SE–N–NNW	
		A	3	SSE–S–NW	30
17	1 30	*As*	2	E–W	60–90
17	2 00	*As*	2	E–W	60–90
17	2 30	*A*	2	SE–NW	25
		Cs	2	E, SE, N	0–80
		Ss	2	E, SE	
17	3 00	*C*	2	NNW	30
17	3 30	*A*	1	E–Z–W	90
17	4 00	*G*	1	NW	30
17	18 00	*O*			

[g] Radiation-point $\delta = 66°$, $\alpha = 1^h\ 00^m$

[h] Radiation-point $\delta = 67°$, $\alpha = 9^h\ 30^m$

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Nov 17	20 00	A	2	NE–NNW	10
17	22 00—	C	2	SE–NE–NW	30
18	0 00				
18	0 30	C	2	E–NW	15
		A	1	E–Z–W	90
18	1 00	C	2	E–NW	15
		A	1	E–Z–W	90
18	1 30—	C	2	E–NW	15
18	2 00				
18	18 00—	O			
18	23 00				
19	4 00—	O			
19	6 00				
19	16 00—	O			
19	24 00				
20	2 00—	O			
20	6 00				
21	0 00—	O			
21	2 00				
22	22 00	O			
22	22 35	C	2	E–N–WNW	35
22	22 50	C	2	E–N–WNW	15
23	2 10	C	1	N	15
23	2 30	O			
23	3 20	S	2	NE	
28	18 20	A	1	ESE–NW	30
30	0 00	C	2	N	
30	0 10	C	2	All sky	0–90
30	0 15	C	2	NW	20
		A	2	NE–Z–NW	90
		G	2	Near zenith	30–90–30
30	0 20	G	1	Near zenith	80–90–80
30	0 45	O			
30	1 15—	O			
30	2 00				
30	19 35	Cs	2	ENE–NNW	30
30	22 30	Cs	2	E–S–W	80
30	23 00	Cs	2	All sky	0–90
30	23 30	O			
Dec 1	0 00	C	2	ENE–N	10
1	3 10	C	1	NE	0–?
1	3 25	O			
1	4 00—	O			
1	6 00				
1	22 00	C	1	NE–N	
2	23 30	A	1	NE	10
2	23 55	Cs	1	E–N–W	15–18
3	1 00—	O			
3	2 00				
3	18 00	O			
3	19 30	A	2	ENE–N–NW	5
3	20 00	A	2	ENE–N–NW	7
3	20 30	A	2	ENE–N–NW	10
3	23 00	C	1	ESE–NW	15
3	23 30	A	2	E–Z–W	90
4	0 00	A	2	E–NW	
4	0 30	Cs	2	NE–NW	18
4	1 00	Cs	2	N–NNE	30
4	1 30	Cs	2	N,NNE	30
4	2 00	3C	2	NW,N,E	10,25,15
		A	2	E,S–W	20
		Ss	2	E,SE–Z	0–90
4	2 15	C	2	W	
		A	2	E–S–WSW	15
4	2 45	G	2	E–S–WSW	5–70
4	3 15	G	2	E–S–WSW	5–60
4	4 00	G	2	E–S–WSW	5–90

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Dec 4	4 30	G	1	E	
4	18 25	2A	2	ENE–N–WNW	10,30
4	19 15—	A	2	E–Z–W	90
4	19 35	C	2	E–Z–W	90
4	20 00	Cs	2	SE–W,SE–N	30
4	21 00	3C	2	NE–Z–SW	60,90,60
4	22 00	2C	2	ENE–N	10,18
		Ss	2	E–Z	0–90
4	22 30	Cs	2	NE–NW	15–30
		Ss	2	E	45
4	23 00	A	2	ESE–NW	15
		Cs	2	All sky	
4	23 30	Cs	2	E,S	30
		Ss	2	E,S	60
5	0 00	Cs	2	N,E,S	30
		Ss	2	E,S	60
5	2 00	A	2	E–Z–W	90
5	2 30	A	2	E–Z–W	90
		A	2	SSE	5
5	3 00	O			
5	3 30	O			
5	4 00	A	2	E–Z–W	90
		A	2	SSE	5
5	4 30—	O			
5	6 00				
6	0 10	C	2	N sky	20
6	0 30	C	2	N sky	30
6	1 00	C	2	E–Z–W	90
6	1 30	C	2	E–Z–W	90
		C	1	WNW–Z	70
6	2 00	C	2	E–Z–W	90
6	2 30	C	3	E–S–WNW	70
6	3 00	C	2	All sky	0–90
6	3 30	Cs	3	All sky	0–90
6	3 40	Cs	2	All sky	0–90
6	4 00	C	2	NE–NW	10
		G	2	S sky	10–80
6	4 30	2C	2	N,E	
6	5 00	G	2	Around horizon	15–20
6	5 30	C	2	NE–NW	15
		G	2	S sky	20
6	6 00	G	2	E–SE	10
6	22 15	G	2	N sky	
6	22 35	Cs	2	WNW–N	35
		G	2	Z	
6	23 30	G	2	N sky	
6	23 40	O			
6	23 50	A	2	E–Z–W	90
7	0 00	As	2	E–Z W	70–90–70
7	0 30	As,C	2	E–Z–W	70–90–70
7	1 00	Cs	2	E–W	
		Ss	3	E–Z	0–90
7	1 30—	C	2	E–NW	
7	2 00				
7	2 20—	C	2	E–NW–W	
7	3 00	Ss	1	All sky	
		G	1	All sky	0–90
7	4 00	O			
8	0 30	A	2	ENE–NNW	30
8	1 00	O			
8	2 00	G	2	E–NW	75
8	2 30	C	2	N	30
8	4 10	C	1	NNE–W	30
		G	1	All sky	0–90
8	4 30	O			
8	5 00	A	1	N	20
8	22 00	Cs	2	E–N	10

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Dec 8	22 30	*O*			
8	23 00	*Cs*	2	N,E	15
8	23 30	*G*	2	SE–Z	0–90
9	0 00	*G*	1	Z	90
		C	2	ENE–N	10
9	4 00–	*O*			
9	6 00				
9	23 00	*Cs*	2	N	35
10	0 20	*C*	1	E–Z–W	90
10	1 00	*C*	2	E–Z–W	90
		C	2	E–S–W	80
10	1 30	*G*	2	All sky	0–90
10	2 00	*G*	2	N sky	
10	2 30–	*A*	1	N	
10	3 30				
10	8 00	*Cs,Co*	2	ESE–S–W	90
10	20 00	*Cs*	2	E–W	28
10	22 00	*Cs*	2	NE–NNW	20–25
		G	2	Z	
10	22 35	*C*	3	NE–NW	20
10	23 00	*C*[a]	4	NE–NW	20
10	23 30	*C*	1	NE–NW	20
10	23 55	*C*	2	NE–NNW	35
11	0 30	*C*	2	NNE–Z–NNW	90
11	1 00	*C*	2	SE–Z–NW	90
11	1 30	*Co*[b]	2	All sky	
11	2 00	*G*	1	All sky	
11	2 30	2*C*	2	ENE–NW	10
		G	2	E,S,W	
11	3 00	*G*	2	E sky	30
11	3 30	*G*	1	E–S	
11	4 00	*A*	2	E–S–W	20
		C	2	NE	
11	4 30	*G*	2	N sky	60–70
		C	2	E,W	10
		A	1	ENE–Z–WSW	90
		A	1	E–S–SW	10
11	5 00	*A*	1	ENE–Z–WSW	90
11	5 30	*A*	1	E–S–SW	10
11	6 00	*A*	3	ENE–Z–WSW	90
		A	2	E–S–SW	10
		G	2	N sky	60–70
11	6 30	*A*	4	ENE–Z–WSW	90
		G	3	N sky	
11	7 00	*A*	3	ENE–Z–WSW	90
		G	3	N sky	
11	7 30	*A*	2	ENE–Z–WSW	
		G	2	N sky	
11	8 00	*G*	2	All sky	0–90
		A	2	E–Z–W	90
11	16 00	*O*			
11	18 00–				
11	20 00				
11	21 15	*A*	2	NE–W	60
		C	2	NE	
11	22 00	2*A*	2	E–NW	20,45
11	22 30–	*C, Ss*	2	E,NW–Z	0–90
11	23 00				
12	0 00	*C, Ss*	2	E,NW–Z	0–90
12	0 30	*A*	2	SE–S–SW	30
		C	2	NE–NW	15
		G	2	W	
12	1 00	*Cs*	2	SE	Low
		A	2	ESE–Z–NW	90
12	1 30	*A*	2	ESE–Z–NW	90

Date	L M T	Form	Intensity	Position	Altitude
1923	*h m*				°
Dec 12	2 00	*A*	1	E–S–W	35
12	4 00–	*O*			
12	6 00				
12	18 00	*A*	2	N	
12	20 00	*A*	1	SE–NW	
12	22 00	*C*	3	E–NW	60
		C	3	ESE–SSE	45
12	22 30–	*Cs*	3	NE–NW	
12	23 00	*G*	2	E,S sky	
12	23 30	*G*	2	N,E sky	
13	0 00	*Cs*	2	NE–W	
		A	2	SE–S–WSW	30
		G	1	E,Z	
13	0 45	*Cs*	2	E,N,Z	
13	2 05	*A*	1	E–S–W	25
		G	1	N sky	
13	2 30	*G*	1	N sky	
13	3 00	*C*	2	W	
		G	1	N sky	
13	3 30	*A*	1	E–W	25
13	3 55	*G*	2	N sky	
13	4 30	*A*	2	E–S–W	15
13	5 00				
13	5 30				
13	6 00	*G*	1	All sky	0–90
13	6 30				
13	7 00				
13	23 00	*G*	2	Z	
14	0 00	*G*	2	All sky	
14	0 30	*C*	1	NE–WNW	20
		G	2	S,E sky	
14	1 00	*C*	2	NE–WNW	20
14	1 30	*O*			
14	2 00	*G*	1	E	
14	2 30–	*O*			
14	3 30				
14	4 30	*Ss*	2	W	
		G	2	S sky	
14	5 00	*G*	1	S sky	
14	5 30	*G*	1	S sky	
14	6 00	*G*	1	All sky	0–90
14	6 30				
14	7 00				
14	20 00	*G*	2	S sky	0–90
14	22 00	*C*	2	E–NNW	60
14	23 00	*G*	2	S sky	
14	23 30	*C*	1	NE	25
		G	2	Z	
15	0 00	*G*	2	Z,S sky	
15	2 30	*A*	1	E–S–W	25
15	3 00	*A*	1	E–S–W	25
15	3 30	*G*	2	NE	
15	4 00	*A*	1	E–S–W	25
15	22 00	*C*	1	E	
15	22 30–	*O*			
15	23 30				
16	0 00–	*O*			
16	2 00				
17	3 00	*A*	1	ENE–NW	20
17	3 30–	*O*			
17	6 00				
17	19 00–	*O*			
17	23 30				
18	0 00	*A*	1	E–N–W	60
18	0 35	*A*	1	N	20

[a] Lower rim *violet* [b] Radiation-point $\delta = 67°$, $\alpha = 6^h\,00^m$

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	LMT	Form	Intensity	Position	Altitude
1923	h m				°
Dec 18	1 00	O			
18	1 20				
18	2 00				
18	2 30				
18	3 00	A	1	NNW	
18	3 30–	O			
18	6 00				
18	18 00–	O			
19	1 30				
19	2 00	Cs	2	ESE–Z–WNW	85,90,85
19	2 30	C	1	NW	80
19	3 00–	O			
19	4 00				
19	18 00–	O			
19	22 00				
19	22 30	A	1	E–N–W	70
20	4 10	G	1	NE	40
20	4 30				
20	18 00–	O			
20	24 00				
21	1 00	C	2	E–Z–W	90
21	2 00	C	2	NW	45
21	2 30	O			
21	4 00–	O			
21	6 00				
21	22 30	C	1	E	30
22	1 00	C	1	NNE	15
23	22 00–	O			
23	24 00				
24	22 00	C	2	W, NW	10–15
24	23 00	Cs	2	SE, W, SW	10–25
25	0 00–	O			
25	1 00				
25	1 30	Cs	1	E, W	
25	2 00				
25	2 30–	O			
25	4 00				
26	22 00	G	2	ENE	
		A	2	E–Z–W	90
26	22 30	G	2	N sky	
26	23 00	Cs	1	SW	35
		G	2	E	
26	23 30	G	1		
26	23 55	C	1	ENE–N–W	40
27	0 25	G	1	W	
		Ss	2	NE	
27	1 00–	O			
27	4 00				
28	22 00	C	1	SE–Z–NW	90
28	22 30	C	1	SE–NW	75
		C	1	NE–NW	30
28	23 00	C	3	E–N–W	35
28	23 30	C	3	NE–Z–W	90
		C	2	S–W	
29	0 00	C	2	S, W	
29	2 30	G	2	All sky	
		C	3	NNW	15
29	3 00	O			
29	3 30	C	2	E–NNW	60
29	3 50–	O			
29	6 00				
29	22 00	C	2	E	
29	23 00	G	2	All sky	
1924					
Jan 1	0 30	C	2	W, NW	15
1	1 00				
1	1 30	Cs	2	W, NW	15
		A	1	NE–NNW	30

Date	LMT	Form	Intensity	Position	Altitude
1924	h m				°
Jan 1	2 00	O			
1	2 30	A	2	E–Z–W	90
1	3 00				
1	3 30				
1	4 00	A	2	E–S–W	60
2	22 00	C	2	E	
2	23 00	A	2	NE–NW	30
3	0 00	G	2	All sky	
3	0 30	C	1	E–N–NW	33
3	1 10–	C	2	E–N–NW	33
3	2 30				
3	3 00	Ss	2	Near zenith	
		G	1	All sky	
3	3 30	G	1	S sky	
3	4 30	G	2	S, E sky	
3	5 00	G	2	S, E sky	
		Cs	2	NW	10,30
3	5 30	A	1	E–N–NW	15
3	17 00	A	2	N	10
3	18 00	A	2	E–N–W	60
3	20 00	A	2	ENE–NNW–W	30
3	22 00	C	3	NE–Z–W	90
		Cs	1	NE–W	30
3	22 30	G	1	All sky	
3	23 10	C	3	NE–W	35
		G	2	Z, S sky	
3	23 50	Cs	3	N, W, E	
4	1 00	Cs, Co[1]	3	All sky	
4	2 15	C	1	W	
4	22 00–	Cs	3	ESE–Z–WNW	90,60
4	24 00	As	2	ESE–Z–WNW	90,60
5	0 30	Cs	2	NE–N–NW	10
		A	2	E–S–NW	15
5	1 00	A	2	E–S–NW	15
5	1 30	G	1	NNE–NW	
5	2 00	O			
5	4 30	O			
5	22 00	A	2	NE–WNW	20
5	22 30				
5	23 00	A	2	NE–WNW	20
		C	2	E	30
5	23 30	Cs	2	E, NW	
		A	2	N–WNW	20
6	0 00	C	2	ENE–NW	20
		A	2	ENE–NW	30
6	1 00	A	2	N	20
6	2 35	A	2	E–Z–WNW	90
		A	2	NE–WNW	30
6	3 00	G	1	N sky	60
6	3 30				
6	3 55				
6	6 15	G	2	N sky	60
6	22 00	C	2	NW–NE	45
6	23 00	C	1	N	
7	0 00	A	2	N	10
7	0 30	Cs	3	ENE–N	20,50
7	1 00	G	3	N	
7	1 30	C	2	N	25
		G	2	Z	90
7	2 00	C	2	NE–W	20
		G	2		
7	2 30	Ss	2	NE–W	0–90
		G	2	NE–W	0–90
7	3 00	A	1	NE–W	
7	4 00	A	1	E–NW	35
7	4 30	A	2	S–WNW	15
		G	2	E sky	

[1] Radiation-point $\delta = 66°$, $a = 7^h\ 10^m$

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Jan 7	5 00	*A*	2	S–WNW	15
		G	2	E sky	
7	5 30	*G*	1	E sky	
7	6 00				
7	22 00	*A*	2	E–Z–WNW	90
7	22 30	*A*	2	E–Z–WNW	90
		C	3	NE	
7	23 00	*C*	2	NE–SW	35
		Co	1	Near zenith	
		G	2	E	
7	23 30	*A*	2	ENE–NW	20
		Ss	2	S sky	
7	23 55	*G*	1	N sky	
8	0 00–	*A*	1	SE–Z–NW	90
8	1 30				
8	2 00	*C*	1	SE–Z–NW	90
8	2 30–	*G, Ss*	2	SE–S–NW	45
8	4 00				
8	4 15–	*As*	2	E–S–W	90–0
8	4 30				
8	5 00	*O*			
8	5 30	*G*	1	NW	15
8	6 00				
8	22 00	*As*	2	SE–N–NW	60
8	22 30	*G*	1	E	
8	23 00–	*O*			
8	23 30				
9	0 00	*C*	1	NE–Z–SW	90
9	0 30	*C*	2	E	20
9	1 00–	*O*			
9	2 00				
9	3 00	*G*	1	E	
9	4 00	*O*			
9	4 30	*G*	1	W	
9	5 00	*As*	2	E–S–W	90–30
9	6 00–	*As*	1	E–S–W	90–30
9	8 00				
9	20 00	*O*			
9	22 00	*A*	2	E–S–W	45
9	22 30	*A*	2	E–S–W	45
		C	2	ENE, N	0–90
9	23 00	*A*	2	E–S–W	45
9	23 30	*A*	2	E–Z–W	90
		A	2	NE–NW	20
10	0 00	*A*	2	E–Z–W	90
		A	2	NE–NW	20
		A	1	ESE–S–WSW	20
10	2 00	*A*	3	NE–N–W	20
		G	1	S sky	
10	2 30	*G*	1	S sky	
10	3 00	*O*			
10	3 30	*C*	2	E–W	40
10	4 00	*C*	1	NE–NW	25
		G	1	S sky	
10	4 30	*G*	1	N, E, Z, S	
10	5 00				
10	5 30				
10	6 00				
10	8 00				
10	22 00	*Cs*	2	All sky	
		As	2	All sky	
10	23 00	*Cs*	2	All sky	
		As	2	All sky	
11	0 10	*C*	3	ENE–SW	70
		2A	1	ENE–SW	10, 15
11	0 35	*C*	2	W	
		G	2		
1924	*h m*				°
Jan 11	1 00–	*G*	2	S sky	
11	1 30				
11	2 00	*As*	3	E–S–W	90–60
		A	2	SE–S–SW	10
11	2 30	*As*	3	ESE–Z–WSW	60–90–60
		Ss	3	N sky	
11	3 00	*A*	1	ESE–Z–WNW	90
11	4 00	*G*	2	ESE	
		C	2	ESE–Z–WNW	90
11	4 30	*Ss*	2	ENE–Z	
11	5 00–	*G*	2	E–S	
11	6 00				
11	22 00	*O*			
12	1 30	*C*	2	ENE–WSW	
12	2 00				
12	2 30	*Cs*	2	S, W sky	
12	3 00	*A*	2	E–WSW	10
		Cs	2	W, NW	
12	3 30	*A*	2	E–WSW	10
12	4 00				
12	6 00–	*O*			
12	7 00				
12	8 00	*G*	2	S–SW	
12	22 00–	*A*	2	ESE–NW	45
12	22 30				
12	23 00	*As*	1	ESE–N–NW	60–90
12	23 30				
13	0 00	*C*	2	E–NW	40
13	0 30	*A*	2	NE–NW	30
		C	2	W	
		G	2	SE–Z	0–90
13	1 00	*A*	1	NE–NW	30
13	1 30	*C*	3	E–Z–W	90
		Cs	2	NW	
13	2 00	*C*	2	E–WNW	35
13	3 00	*G*	2	NW	
13	4 00	*G*	2	All sky	
13	4 35				
13	5 05	*O*			
13	5 35	*A*	1	NE–N–WSW	60
13	6 00	*G*	1	NE	
13	6 30	*G*	1	NE	
		C	1	W	Low
13	7 00	*O*			
13	22 00–	*O*			
14	8 00				
14	15 00–	*O*			
14	24 00				
15	2 00	*O*			
15	2 30				
15	3 00	*C*	2	WNW	
15	3 30–	*O*			
15	6 00				
15	16 00–	*O*			
15	20 30				
15	23 00	*A*	1	NE–N–WNW	30
15	23 30	*C*	1	ENE–N–W	60
16	0 00	*C*	2	ENE–Z–W	50–90–50
16	0 30	*G*	2	NNE, WNW	
16	1 00	*Ss*	1	WNW	
16	1 30	*Cs*	2	N sky	
16	2 30	*C*	1	NE–NW	15
16	3 00–	*O*			
16	4 00				
16	5 00	*C*	1	Z	
16	6 00	*As*	2	E–Z–W	90

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Jan 16	6 30	3A	2	E,N,W	10
		Ss	2	Z	90
16	7 00	As	2	E–Z–W	90
16	8 00	As	2	E–Z–W	40–90–40
		G	2	All sky	
16	18 00–	O			
16	20 00				
16	22 00	3C	1	ENE–N–WNW	25–65
16	22 30	3C	2	ENE–N–WNW	25–65
		Ss	3	N	5–10
16	23 00	C^m	3	N	8
		C	2	ENE–N–W	60
		Co^n	1	Near zenith	
16	23 30	C	2	NE–NW	10
17	0 00	C^o	3	40°S–Z–NE	90
		C	2	W	10
		Ss	2	O–Z	90
17	0 30	C	1	NE–E	Low
17	1 00	A	1	NE–WNW	15
17	1 30–	O			
17	2 00				
22	0 15	C	1	E	10
		Ss	2	Z	
22	0 45	Ss	2	NE	Low
22	1 30	C	2	NW sky	30–90
22	2 00	C	1	NW	30
22	2 35–	O			
22	8 00				
22	16 00–	O			
22	22 00				
23	0 40	C^p	3	E–WSW	30
		Ss	2	O–Z	90
23	1 30	C	1	E–WSW	30
		Ss	2	W	
23	2 00	C	1	W	15
23	2 30	C	2	ENE–Z–WNW	90
23	3 00–	O			
23	4 00				
23	4 30	C	2	WNW	15
23	22 00	A	2	ENE–Z–WSW	90
23	22 10	C	1	N	
		Ss	2	N	25
23	22 35	2A	1	E–N–W	15,35
		C	1	NW	20
23	23 05	C	2	Z	
		A	2	NE–NW	40
		G	1	All sky	
23	23 35	C^q	3	All sky	
23	23 55	C	1	N	15
24	0 20	Ss	1	WSW	
24	0 55	C	1	W	10
24	1 30–	O			
24	2 30				
24	3 00	Ss	1	ENE–Z	0–90
24	3 30	C	2	NW	
24	4 00	A	1	E–SW	15
24	22 00–	O			
24	24 00				
25	4 30	G	1	NE	
25	20 00	C	2	E–N–NW	30
25	22 30	A	1	E–N–W	35
25	23 00	C	2	E–Z–W	90
		Ss	2	S,E,Z	
26	0 00	O			
26	18 00	O			
26	20 00	A	2	E–N–NW	30
26	21 00				

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Jan 27	22 00	A	2	E–Z–W	90
		C	2	E–Z–W	90
27	23 00	3A	1	N	30
28	22 00	C	2	E–Z–W	90
28	22 30	C	2	E–Z–W	
		A	2	E–W	
28	23 30	Overcast			
29	20 00	A	2	E–N–W	30
29	22 00	C	2	NE–N–W	15
		G	2	SW,S sky	30
29	22 30	C	2	NE,NW	
		G	2	All sky	
29	23 00	G	1	All sky	
29	23 30	G	1	N,E,Z	
30	0 00	G	1	SE,N,E,Z	
30	1 00	G	2	SE	20
30	2 00	C	2	ESE–S–WSW	80–45
30	2 15	C	3	E–N–W	60
30	2 30	C	1	E–N–W	60
		C	2	WNW	30
30	3 00	A	1	E–Z–WNW	90
30	3 30	Ss	2	NE,W	
30	4 00	G	2	Around horizon	
30	5 10	Co^r	2	Z	
30	5 30	Co	1	Z	
30	6 00				
30	18 00	A	2	E–N–W	30
30	20 00				
30	22 00	G	2	All sky	
31	0 10	A	2	E–S–W	35
		G	1	NNE	
31	0 35	A	2	E–S–W	35
		A	2	NNE–N–W	35
31	1 00	A	2	E–Z–WNW	90
		A	1	E–S–SW	20
31	1 30	A	1	NE–NNW	25
		G	1	ESE	
31	1 55	C	2	N–Z	0–90
		G	1	All sky	
31	2 30	G	2	E,N,W,S	
31	3 00	G	1	S	
31	4 00	A	2	ENE–N–W	60
31	4 30	A	2	E–Z–W	90
31	5 00	A	1	NE–NW	60
31	5 30	G	1	ENE	30
31	6 00	G	2	E–S	
31	7 00	G	1	E–W	
31	22 00–	O			
31	23 30				
Feb 1	0 00	C	1	ESE–WSW	50
1	0 30	G	1	All sky	
1	1 00–	O			
1	2 00				
1	2 30	Cs,Ss	1	N sky	
1	3 30	C	1	NW	15
1	4 00	S	2	NW	
		A	1	E–Z–W	90
1	18 00–	A	1	ENE–N–WNW	20
1	20 00				
1	22 00–	Cs	2	NE–WNW	60
1	24 00				
2	0 30	Cs	2	NE–NW	15
2	1 00	Cs	2	NE–NW	15
		G	1	ESE	
2	1 30	O			
2	2 00				
2	5 30	G	1	N sky	

[m] Lower rim red [n] Radiation-point $\delta = 69°$, $\alpha = 3^h\ 20^m$ [o] Lower rim red [p] Intense colors, red, green, and white [q] Lower rim red [r] Radiation-point $\delta = 63°$, $\alpha = 12^h\ 50^m$

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Feb 2	22 00–	O			
2	24 00				
4	0 00	A	2	E–W	30
4	0 30	A	1	E–W	30
4	1 00	C	1	NE	
		G	2	ESE	25
4	1 30	A	1	SE	15
4	2 00	Ss	2	W	
4	2 30	C	1	ENE–W	
4	3 00–	O			
4	3 30				
4	4 00	C	2	ENE–Z–WSW	90
4	4 30	Cs	2	NE, E	
		Ss	2	NE, E	
4	5 00	A	1	E–S	20
4	5 30–	O			
4	6 00				
4	22 00–	Cs	2	E–N	
4	23 30				
5	0 00	C	2	E–N	
5	0 30	C	2	ENE–W	35
5	1 05	C	1	E–NW	20
5	1 35	C	1	E–NW	20
5	2 00	G	1	E	
5	2 30	C	2	ENE–W	30
		Ss	2	E–Z	
5	3 00	2A	1	E–S–W	90, 75
5	3 30	A	2	ENE–S–W	60
5	4 00	A	2	ENE–S–W	60
		C	2	ENE	15
5	5 00	As	1	E–Z–W	70–90–30
5	5 30	G, Co[s]	2	All sky	
5	6 00	G, Co	1	Z	
5	18 00–	O			
5	20 00				
5	22 00	A	2	E–N–WNW	60
5	22 30–	Cs, Ss[t]	2	All sky	
5	24 00				
6	0 30	C	2	ENE–N–W	15
		C	2	E–Z–W	90
		A	2	SE–S–W	30
6	1 00	C	2	ENE–S–W	60
		A	2	SE–S–W	30
6	1 30	Cs	2	N, NE	
6	2 00	G	2	S sky	
6	2 45	C	2	Z–E–Z	20–90
		A	2	ESE–S–SW	10
6	4 00	G	2	All sky	
6	4 15	G	2	S sky	12
		Ss	2	E–Z	
6	4 55	G	2	S sky	
		Ss	2	E–Z	
6	5 30	G	1	S sky	25–90
6	6 00	As	1	E–Z–W	15–90–40
6	8 00	O			
6	18 00	A	2	E–N–WNW	15
6	20 00	O			
6	22 00	A	2	E–S–W	35
		Cs	2	E–NE	15
6	22 30	C	2	E–Z–N–WSW	
6	23 00	C	1	E–Z–N–WSW	
6	23 30	A	2	E–S–W	40
		G	1	N sky	
7	0 00	C	2	E–S–WSW	30
		2A	2	NE–N–NW	15, 30
7	1 00	A	2	N	15

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Feb 7	2 00	A	2	E	
7	2 30	A	2	E–S–SSW	20
		C	2	NE–W	20
		G	2	Z	
7	3 05	Cs	2	All sky	
7	3 35	C	2	N	35
7	3 55	A	2	NNE–W	30
7	4 30	As	1	E–S–W	90, 30
		G	2	S	30
		C	2	WNW	5
7	5 00	3A	1	E–Z–W	5, 90, 30
7	5 30	A	1	ENE–N–W	30
7	6 00				
7	8 00	O			
7	18 00	A	2	E–N–WNW	20
7	21 20	A	2	E–N–WNW	35
		C	2	E	Low
7	22 00	2A	1	N	35
7	23 00	2A	1	E–Z–W	90
8	0 00	C	3	NNE–WSW	30
8	0 30	Cs	1	All sky	
8	1 00–	O			
8	1 30				
8	2 00	A	1	E–S–SW	20
		C	2	NW	
8	2 30–	O			
8	3 00				
8	3 30	C, Ss	2	E	10
8	4 00	C	1	SE–N	30
		Ss	2	ENE	Low
8	4 30	A	2	E–S–W	15
		A	1	E–Z–W	90
		G	2	S sky	
		Ss	2	E	
8	5 00	A	2	E–S–W	15
8	6 00	A	1	E–S–W	15
		A	1	E–Z–W	90
		G	1	S sky	
8	23 00	S	2	ENE	
8	23 30	A	1	E–Z–W	90
9	0 00	C	2	NE–W	40–90
9	22 00–	C	2	ENE–WNW	
9	23 00				
9	23 30	Cs	2	ENE–WNW	30
10	0 30	Cs	2	NE–W	
10	1 00	Cs	2	NE–W	20–30
10	1 30	2A	2	ENE–NW	30
				ENE–Z–W, 60°	90
10	2 00	C	2	E	10
		G	2	S, W sky	
10	3 00	C	1	N	30
10	4 00	C	1	NW	25
10	6 00	A	2	E–W	60–90
14	2 45	C	2	SE–Z–NW	90
14	4 00	C	2	N	40
		G	2	All sky	
14	4 30–	O			
14	5 30				
14	18 00–	O			
14	23 30				
15	0 00	A	1	E–N–WNW	30
15	1 15	Cs	1	NW	
15	2 00	C	2	N	45
15	2 30–	O			
15	6 00				
18	1 00	Cs	1	E	15

[s] Bands of bright spots, arranged in circles, from the bands go streamers, forming a corona with radiation-point $\delta = 63°$, $\alpha = 13^h\ 10^m$

[t] Very variable, the curtains occasionally form concentric circles with center near Polaris

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Feb 18	1 30	O			
18	22 30–	C	1	E–N–W	45
18	23 00				
18	23 30	C	2	NW	Low
19	0 00–	O			
19	6 00				
19	18 00–	O			
19	20 00				
19	22 00	A	1	ENE–W	30
		Ss	2	W	
20	0 00	A	1	ENE–W	30
		A	2	E–Z–W	90
20	0 30–	O			
20	1 30				
20	2 00	Ss	2	NE	15
		C	2	NNW	
20	2 30–	O			
20	4 00				
20	18 00–	O			
20	20 00				
20	23 05	G	1	NE–Z–W	90
20	23 35	G	1	N sky	
21	0 00–	O			
21	0 30				
21	0 40–	C	3	NE–N	15
21	0 50	G	2	NNW	10
21	1 30	C	2	E–Z–W	90
21	2 00	C	3	E–Z–W	90
		C	3	ENE–W	30
		G	2	S	0–20
21	2 30	A	2	E–S–W	15
		G	2	E, N sky	
21	3 00	A	2	E–S–SW	15
		Ss	2	WSW	
21	3 30–	Ss, C	2	All sky	
21	4 00				
21	18 00–	O			
21	20 30				
21	22 00	C	1	ESE–Z	0, 90
21	22 30–	O			
21	24 00				
22	0 30	C	1	W	15
22	0 50–	O			
22	2 00				
22	23 00	C	2	E–Z–W	90
22	23 30	C	2	Z	
23	0 00	C	2	E–N–W	25
		G	2	Z, SW	
23	22 00	C	1	NE–Z–SW	90
24	0 35	G	1	Z	
24	1 30	C	2	Z	
		S	2	E, W	
24	2 00	O			
24	20 00	O			
24	20 40	A	3	E–Z–W	90
24	22 00	C[u]	2	N	0–20
		A	2	E–Z–W	90
24	22 45–	C	2	NE–N–WNW	15
24	22 55	A	2	E–Z–W	90
24	23 30	C	1	E–N–WNW	10
25	0 00	O			
25	18 00	O			
25	21 35	C	3	ENE–W	20
25	21 40	C	3	ENE–W	20
		A	3	E–Z–W	90
		C	3	ENE–W	20
25	21 55	A	3	E–Z–W	90
		Ss	1	E	

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Feb 25	22 00–	O			
25	23 00				
25	23 30	C	1	NE–NW	30
26	0 00	G	1	NNE	
26	0 30	G	2	Z, W sky	
26	1 00	O			
26	1 30				
26	2 00	G	1	E	60
26	2 30	O			
26	3 00	A	2	E–N–W	30
		As	1	E–S–W	30, 45
26	3 30	O			
26	4 00	G	1	SSE	30
26	18 30	O			
26	20 00	C	2	SE–NW	
27	2 15	C	2	ENE–NNE–NW	40
		A	2	E–S–W	30
27	3 00	As	2	E–S–W	90–30
27	3 30–	O			
27	4 00				
27	18 00–	O			
27	20 00				
27	22 00	A	2	N	50
27	23 00	G	2	N	
28	0 00	C	3	ESE–N–W	15
28	0 30	G	2		
28	1 00	C	1	N	15
		G	2	All sky	
28	1 35	G	2	Z	
28	2 00	A	2	E–S–SW	70
28	2 30	C	2	ENE–N–W	30
		A	2	E–S–W	30–60
28	3 00				
28	3 35	A	1	E–S–W	30–60
28	4 00				
28	4 30	G	1	S, W sky	
28	5 00	O			
28	18 00	O			
28	20 00				
28	22 00	Ss	2	ESE	10
28	22 30				
28	23 00	C	1	NE–NW	30
28	23 30				
29	0 00	C	2	NE–NW	30
29	0 30	C	2	NNE–NW	10
29	1 00	G	2	N sky	
29	1 30	A	1	N	
29	2 00	C	1	N	30
29	2 30	O			
29	3 15	A	1	ENE–N–WNW	30
29	4 00	O			
29	5 00				
29	22 00	C	1	NE–NW	
29	22 30	G	2	NNW	
29	23 00	C	2	ENE–NW	45
29	23 30	C	2	NE–NW	30
Mar 1	0 00	C	2	NE–NW	30
1	0 30	A	2	NE–N–NW	15
1	1 00				
1	1 30	A	2	NE–N–NW	15
		C	2	N	45
1	2 00	O			
1	18 00–	O			
1	24 00				
2	2 00	A	2	NNE–SW	25
2	2 30	G	2		
2	3 00–	O			
2	6 00				

[u] The curtains are forming concentric ellipses with an horizontal extension of 90°

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Mar 2	23 00	*C*	2	N	45
3	0 30–	*Cs*^{v}	3	N sky	
3	1 00				
3	1 30	*C*	2	N	
3	2 00				
3	2 30	*A*	2	E–S–W	15
3	3 00	*C*	2	NW	
3	3 30	*A*	2	E–S–W	15
3	4 00	*O*			
3	19 30–	*C*	3	E–S–W	50
3	19 55				
3	21 00	*A*	2	NNE–Z–W	90
		Cs	2	NNE–N–W	
3	22 00	*C*	2	E–N–WNW	20
		Ss	2	NE, NW–Z	0,90
		A	2	SE–S–W	7
3	22 30	*Cs*	4	E–W	60,90,45
		A	3	S	
3	23 00	*C*	3	E–WNW	65,90,60
		A	2	S	7
3	23 30	*Co*^{w}, *C*	4	All sky	
4	0 00	*C*	2	N	15
4	1 00	*C*	3	Around horizon	
4	2 00	*C*	2	N	15
4	2 30	*A*	2	E–S–W	15
		Cs	2	NE–NW	20–30
4	3 00	*A*	1	E–S–W	15
		Cs	2	NW	
4	3 30–	*O*			
4	4 00				
4	4 15	*C*	1	NNW	10
		G	2	S–SW	
4	4 35	*O*			
4	22 00	*G*	2	N	
5	0 00–	*O*			
5	2 00				
5	22 00	*A*	2	NNE–WNW	15
5	22 30	*C*	3	NE–N–NW	30
		A	2	E–S–SW	20
5	23 00	*C*	4	NE–Z–NW	90
		A	2	E–S–SW	20
5	23 30	*C*	2	NE–N–NW	45
		A	2	E–S–SW	20
6	0 00	*Cs*	2	N, NW	
		G	2	S sky, NE–Z	
7	20 25–	*A*	2	E–N–W	70
7	20 45				
7	22 00	*As*	1	E–W	30–90
7	22 30	3*A*	2	E–W	60–90
7	23 00	*Cs*	2	E–Z–W	60–90–80
7	23 30	*C*	2	E–Z–W	90
		C	2	E–S–W	60
8	0 00	*C*	1	E–Z–W	90
8	0 30	*C*	2	ENE–N–WNW	40
8	1 00				
8	1 30	2*C*	2	ENE–N–WNW	30,40
8	2 00	*C*	2	N sky	
8	2 30	*Cs*	2	NE–Z–NW	
		G	2	S sky	
8	3 00	*G*	3	S sky	
8	3 30	*Cs*	2	NE	15–30
8	4 00	*O*			
8	22 00	*C*	2	ENE–N–WSW	
8	22 30	*C*	2	ENE–N–WSW	
8	23 00				
8	23 45	*Co*^{x}, *C*	4	All sky	

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Mar 9	0 30	*Cs*	2	S, W sky	
9	0 55	*Cs*, *Co*	3	All sky	
9	1 30	*Cs*	2	E–S–W	60
		Cs	2	N, NW	
9	2 00	*O*			
9	21 00	*A*	2	NE–NW	10
		Ss	2	E	
9	22 00	*A*	1	NE–NW	15
9	22 30	*A*	2	NE–N–W	30
9	23 00				
9	23 30	*A*	2	ENE–Z–W	90
		G	2	N	10
10	0 00	*A*	2	ENE–Z–W	90
		G	2	N	10
10	1 00	*C*	2	E–Z–W	90
10	2 00	*G*	1	All sky	
10	2 45	*G*	2	S sky	
10	3 15	*C*	1	ENE–N–WNW	25
		G	1	S sky	
10	4 00	*O*			
10	4 10	*G*	1	E–Z	0–90
10	4 30	*O*			
10	21 00	*C*	2	E–S–W	30
10	22 00	*G*	1	N sky	
10	23 15	*C*	2	NE–Z	
11	0 05	*G*	2	All sky	
		C	2	N	Low
11	0 30	*C*	2	ENE–Z–W	
		A	2	S	Low
11	1 00	*C*	2	ENE–N–WNW	60
11	1 30	*A*	2	S	60
11	2 00	*G*	2	S sky	10–90
11	2 30	*C*	2	E–Z–W	90
11	3 00	*Ss*	2	WNW	
11	3 30	*O*			
11	22 00–	*C*	2	E–WNW	90
11	22 25				
11	23 00–	*Co*^{y}, *Cs*	4	All sky	
11	23 20				
11	23 45–	*Cs*, *Ss*	3	All sky	
11	23 55				
11	23 50–	*Cs*, *Co*^{z}	3	All sky	
11	23 52				
12	0 12	*Cs*, *Co*	3	All sky	
12	0 30	*Cs*, *Ss*	2	All sky	
12	0 50	*Cs*	2	W	
12	2 30	*Cs*, *Ss*	2	All sky	
12	3 00	*O*			
12	22 00	*C*	2	E–Z–W	90
12	22 30	*Cs*	2		
13	0 30–	*Cs*	2	NE–N–NW	15
13	1 00	*G*	2	Z, S sky	
13	1 30	*C*	1	NE–N–NW	
		Ss	2	S, E sky	
13	2 00	*Cs*	2	NE–Z	
		Cs	2	NW, N	15
13	3 00	*O*			
13	22 00–	*O*			
13	23 30				
14	0 00	*A*	2	ENE–N–W	60
14	2 05	*Ss*	2	E, N, NW–Z	
14	2 35	*O*			
14	3 15	*O*			
14	20 30	*O*			
14	21 30				
15	0 05	*C*	1	E	Low

[v] Forming closed circles with center 45° above N horizon [w] Radiation-point $\delta = 67°$, $\alpha = 9^h\ 50^m$, lower rim of curtains red. [x] Radiation-point $\delta = 65°$, $\alpha = 10^h\ 30^m$, streamers of bright green color [y] Radiation-point $\delta = 66°$, $\alpha = 10^h\ 15^m$, curtains of strong red or green color [z] Radiation-point $\delta = 68°$, $\alpha = 11^h\ 00^m$

TABLE 66—*Observations of Aurora Borealis, September 1923 to March 1924*—Concluded

Date	L M T	Form	Intensity	Position	Altitude	Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°	*1924*	h m				°
Mar 15	0 30	*O*				Mar 19	23 00	*C*	1	E	10
15	1 00	*Ss*	2	E		19	23 40	*Co*[aa], *Cs*	3	W sky	15,90
15	1 30	*A*	1	E–Z–W	90	20	0 00	*Cs*[bb]	3	ENE–Z–W	90
15	2 00					21	23 00	*C*	1	Z, W sky	90,60
15	4 00	*O*				23	0 00	*A*	1	NE–NW	20
15	21 00	*O*				23	0 10				
15	22 00	*A*	1	E–NNE–NW	50	23	0 30–	*O*			
15	22 30					23	4 00				
15	23 10	3*A*	1	E–Z–WN	30–90	23	22 40	*A*	1	E–S–W	40
15	23 55	*A*	1	E–NNE–NW	50	23	23 10	*Cs*	2	NE–N–W	20
		A	1	S	10			*G*	2	Z	
16	0 30	*G*	1	N		24	0 30	*C*	2	N	15
16	1 00	*C*	2	NE–NW	30	24	23 30–	*O*			
16	1 30–	*O*				24	24 00				
16	4 00					27	23 30	*C*	2	ENE–WNW	90
16	22 00–	*O*				28	0 00	*Cs*	2	E–S–W	80
17	1 30					28	0 30	*C*	1	NNW	30
17	2 00	*Cs*	1	SSW–W	15	28	1 00	*G*	2	E, Z	
17	3 00	*Cs*, *Ss*	2	Z		28	1 30	*O*			
17	22 00–	*O*				28	2 00	*A*	2	E–Z–W	90
17	24 00					29	21 45	*C*	2	ENE–NW	45
19	22 00	*A*	1	E–Z–W	90	31	0 30	*G*	2	Z	
19	22 30	*A*	1	E–Z–W	90	31	20 00	*G*	1	Z	

[aa] Radiation-point $\delta = 65°$, $\alpha = 11^h\ 45^m$ [bb] Lower rim red

north and south of zenith, the altitude to the left refers to those north of zenith and the altitude to the right to those south of zenith Occasionally the following notation is found *Cs*, 2, *E–W* 30°, 90°, meaning curtains of moderate brightness from east horizon to 30° above west horizon, passing through zenith. The abbreviations for the position of streamers or corona follow the same general plan

The remarks give information about conspicuous coloring and movement, the occurrence of unusual forms, and, when the radiation-point of a corona was observed, the coordinates of this point by means of the declination, δ, and the right ascension, α, the latter expressed in hours and minutes

Tables 65, 67, and 69 contain the results of the observations of cloudiness, which are necessary because notes regarding absence of aurora were not always entered on clear nights. The amount of cloudiness is given on a scale 0 to 10 omitting, however, indications regarding density of clouds. During the first winter the amount of cloudiness was recorded every fourth hour and, later, every second hour

These tables also contain the results of the astronomical observations for geographical position in the form of observed latitudes and longitudes at stated local mean hours By means of these data the positions can be found for the observations entered in the preceding auroral tables

DISCUSSION

(1) AURORAL CHARACTER-NUMBER

For some of the following investigations it will be of advantage to introduce an auroral character-number to serve as a measure of the intensity and duration of an auroral display during a night For this purpose only the observations between 22^h and 6^h were used, because these are systematic, while observations before 22^h and after 6^h frequently are lacking Furthermore, the character-number is defined for clear nights only, that is, nights on which the amount of cloudiness has not exceeded 4 at the hours of observation, thus insuring that the character-number will not be influenced by the

TABLE 67—*Cloudiness on Scale 0 to 10 and Geographic Position September 1923 to March 1924*

Date	Local mean time in hours												Observed geographic position				
	0	2	4	6	8	10	12	14	16	18	20	22	L M T	Lat north		Long east	
1923													*h*	°	′	°	′
Sep 26	10	10	10	10	10	10	10	10	9	10	2	2					
27	9	10	10	10	10	8	4	2	9	10	6	7					
28	4	2	4	3	10	10	3	4	3	10	4	6	16	75	13 5	163	55
29	10	10	10	10	10	10	9	9	9	8	2	3					
30	3	10	10	10	10	10	8	5	5	7	3	2					
Oct 1	3	2	4	10	9	10	10	10	10	10	10	10	12	74	58 3		
2	10	10	10	10	10	10	10	10	10	10	10	10					
3	10	3	6	9	8	4	2	3	3	8	4	10	12	74	49 2		
4	10	1	1	1	1	2	10	2	3	10	10	10					
5	4	10	10	10	10	10	10	10	10	10	10	10					
6	10	10	10	10	10	10	10	10	10	10	10	10					
7	10	10	10	10	10	10	10	10	10	10	10	10					
8	10	10	10	10	6	3	2	2	10	10	10	10					
9	10	10	10	10	10	10	9	3	4	5	3	10	21	74	37 5	165	40
10	6	10	10	10	9	10	5	3	6	1	0	0					
11	0	6	2	10	10	10	9	10	10	10	10	10					
12	10	10	2	2	9	2	1	1	0	0	2	10	18	74	50 1	165	42
13	0	0	10	8	8	8	10	10	10	10	10	10					
14	10	10	10	10	10	10	10	10	10	10	10	10					
15	10	10	10	10	10	10	10	10	10	10	10	10					
16	10	10	10	10	10	10	10	10	10	10	10	3					
17	10	10	10	10	10	10	1	2	3	10	10	10					
18	10	10	10	4	10	10	7	6	3	3	7	10	18	75	04 9	162	55
19	4	10	10	9	9	9	6	0	7	10	10	10					
20	10	10	10	10	10	10	10	10	10	10	10	10					
21	10	10	10	10	10	10	10	10	10	10	10	10					
22	3	0	3	2	2	4	7	9	9	10	10	10	17	74	53 7	162	10
23	10	10	6	10	10	10	9	9	9	5	4	3	17	74	48 9	162	23
24	9	4	2	10	10	10	10	10	10	10	10	10					
25	10	10	10	10	10	10	10	10	10	10	10	10					
26	10	10	10	10	10	10	10	10	10	10	9	8					
27	10	10	9	10	10	10	10	10	10	10	10	10					
28	10	10	2	9	6	5	5	6	3	2	2	1					
29	0	10	10	10	10	10	10	10	10	10	10	10					
30	10	10	10	10	10	1	5	8	10	10	10	10					
31	10	10	10	10	10	10	10	10	10	2	1	1	19	74	58 2	161	15
Nov 1	1	0	1	0	1	0	0	0	0	0	0	1					
2	10	10	10	10	10	10	1	10	10	1	3	10	18	75	01 4	161	48
3	10	10	10	1	9	10	10	3	2	0	0	0					
4	0	3	0	0	2	10	4	5	10	5	4	10					
5	4	3	10	10	4	10	10	10	6	3	6	7	18	75	03 1	161	40
6	4	0	10	10	10	10	10	10	10	0	0	0					
7	0	0	0	1	1	10	10	10	2	1	0	10	18	75	02 2	161	46
8	10	10	10	10	10	10	10	10	10	10	10	10					
9	10	10	10	10	7	10	7	8	0	10	3	10					
10	10	0	0	4	9	10	8	6	8	10	2	1					
11	10	0	1	2	3	3	4	3	4	3	0	0					
12	0	0	0	10	10	10	10	10	10	10	10	10					
13	10	10	10	1	10	10	10	10	10	1	0	0					
14	0	0	0	10	10	10	4	5	2	0	0	0	17	75	11 0	160	13
15	0	0	3	1	3	5	7	8	6	5	10	7					
16	10	10	10	10	10	10	10	10	5	10	10	10					
17	4	2	0	1	0	0	0	0	3	7	0	0	9	75	16 8	159	16
18	0	0	0	3	5	3	0	0	0	0	0	0					
19	0	1	0	0	1	3	0	0	0	0	0	2	16	75	14 8	159	11
20	10	3	2	2	3	3	2	3	3	4	4	5					
21	4	6	10	10	10	3	9	1	10	10	10	9					
22	10	10	10	10	10	10	9	10	10	10	4	3					
23	10	3	9	1	4	10	9	1	9	9	8	9					
24	10	9	3	0	0	3	0	0	8	10	10	10	9	75	14 8	159	31
25	10	10	10	10	3	4	3	0	0	0	0	0					
26	1	2	1	3	2	2	2	3	1	1	3	5	16	75	11 6	159	42
27	9	9	10	8	9	10	10	10	10	10	10	10					
28	10	10	10	10	10	10	10	10	10	10	10	10					

TABLE 67—*Cloudiness on Scale 0 to 10 and Geographic Position September 1923 to March 1924*—Continued

Date	Local mean time in hours												Observed geographic position				
	0	2	4	6	8	10	12	14	16	18	20	22	L M T	Lat north		Long east	
1923													h	°	′	°	′
Nov 29	10	10	10	10	10	10	10	10	10	10	10	10					
30	1	0	0	0	0	0	0	0	0	0	0	0	9	75	08 2	159	39
Dec 1	0	0	0	0	0	0	0	0	2	3	10	0					
2	8	0	3	10	4	2	1	1	2	10	3	10					
3	9	2	2	0	2	2	2	2	0	0	1	0	9	75	13 5	159	14
4	0	0	0	0	0	10	3	0	0	0	0	0					
5	0	0	0	0	2	10	0	2	0	0	0	0	9	75	15 7	158	59
6	0	0	0	0	1	0	2	2	0	0	0	2					
7	0	0	0	0	0	1	4	4	2	0	2	3	9	75	15 2	158	57
8	0	0	0	0	0	0	2	2	1	0	0	0					
9	0	0	2	0	1	1	1	3	3	2	3	0					
10	0	4	3	5	2	3	3	3	0	1	1	3	9	75	13 3	159	02
11	0	0	0	0	0	0	0	0	0	0	0	0					
12	0	0	0	10	2	1	1	1	1	1	0	0	9	75	12 9	159	02
13	0	0	0	0	0	6	2	2	5	3	5	2					
14	0	0	2	2	1	2	2	2	2	2	1	0	15	75	12 3	159	01
15	2	4	0	1	1	3	5	10	3	0	0	0					
16	2	5	10	10	10	10	10	10	4	1	0	0					
17	0	5	3	3	9	10	10	10	10	10	0	0					
18	0	0	0	2	1	1	1	0	1	0	0	0	15	75	14 0	158	46
19	0	1	1	1	3	2	1	1	0	0	2	5					
20	8	4	2	2	1	2	0	0	0	1	1	0	15	75	18 7	158	29
21	1	0	2	0	1	2	3	3	2	1	1	0					
22	0	6	3	0	0	0	0	2	1	1	2	4	13	75	18 1	158	38
23	7	10	10	0	3	10	10	10	7	3	1	1					
24	1	3	9	3	9	10	10	10	9	8	3	0					
25	0	0	0	0	0	5	10	10	10	10	10	10					
26	10	10	10	6	7	10	10	10	2	3	3	0					
27	0	0	0	0	0	6	8	8	6	9	10	10	13	75	21 9	158	00
28	7	10	9	0	2	2	1	1	1	0	2	1					
29	2	7	8	2	2	1	1	1	0	1	0	0	12	75	23 0	158	03
30	9	10	10	10	10	10	10	1	0	0	3	10					
31	10	10	10	0	1	1	3	2	2	1	1	3					
1924																	
Jan 1	1	0	10	10	10	10	10	10	10	10	10	10					
2	10	10	6	3	2	2	2	2	0	0	0	0	16	74	56 0	158	07
3	1	0	0	0	0	0	0	0	0	0	0	0	15	74	54 0	158	47
4	0	0	8	7	10	3	10	10	2	3	2	0					
5	0	0	0	2	1	2	1	1	1	0	0	0	12	74	56 1	158	42
6	0	0	0	0	0	0	0	0	0	0	0	0					
7	0	0	0	0	0	0	0	0	0	0	0	0	10	74	57 6	158	46
8	3	0	0	1	0	2	1	0	1	1	0	0					
9	0	0	0	0	0	0	0	0	0	0	0	0	9	74	57 0	158	22
10	0	0	0	0	0	2	1	1	1	1	0	0					
11	0	0	2	5	4	8	9	9	2	1	1	2					
12	0	2	0	0	0	1	0	1	0	0	0	0	9	75	08 4	157	30
13	0	0	0	0	0	0	0	0	0	0	0	0					
14	0	0	0	0	0	0	0	0	0	0	0	0	15	75	09 5	157	23
15	0	0	0	0	0	0	1	1	2	1	2	1					
16	1	1	0	0	0	0	6	5	7	6	5	0	18	75	09 6	157	20
17	0	0	1	8	10	10	10	10	10	10	10	10					
18	7	5	10	10	10	10	10	10	10	10	10	10					
19	10	10	10	10	3	4	10	10	10	10	10	10	9	75	09 5	157	21
20	3	4	3	1	2	1	2	2	2	2	1	1					
21	2	1	1	2	0	1	1	1	1	1	0	0	15	75	16 0	156	46
22	0	0	0	2	1	0	0	0	1	1	1	1					
23	0	0	0	0	0	1	1	2	1	1	1	0	15	75	17 7	156	28
24	0	1	1	1	3	1	1	1	1	4	5	4	15	75	18 9	156	22
25	6	6	7	8	8	8	8	8	10	10	3	2					
26	1	1	2	4	5	5	10	10	10	8	8	4	9	75	15 6	156	30
27	10	10	10	10	10	10	10	10	9	8	10	10					
28	10	9	2	5	4	3	3	2	2	2	8	10	18	75	13 0	156	36
29	10	10	8	4	6	8	10	10	10	2	2	1					
30	0	0	1	10	6	4	3	2	1	2	6	7					

TABLE 67—*Cloudiness on Scale 0 to 10 and Geographic Position September 1923 to March 1924*—Concluded

Date	Local mean time in hours												Observed geographic position				
	0	2	4	6	8	10	12	14	16	18	20	22	L M T	Lat north		Long east	
1924													h	°	′	°	′
Jan 31	0	0	1	0	0	1	2	2	1	1	2	2	9	75	12 7	156	32
Feb 1	2	3	1	3	1	1	1	1	0	0	0	0					
2	0	0	1	2	1	1	3	2	4	5	2	0	9	75	12 7	156	45
3	0	5	3	2	1	1	1	0	1	1	1	0					
4	2	3	1	0	6	1	2	1	0	0	0	0	18	75	12 0	156	57
5	0	0	0	0	0	1	1	1	0	1	0	1					
6	0	0	0	0	0	0	0	0	0	0	0	0	18	75	10 5	157	38
7	0	0	0	0	1	1	0	1	1	0	1	0					
8	0	0	1	0	0	0	0	0	0	0	0	0	18	75	11 1	157	39
9	0	10	10	10	2	1	1	1	1	0	0	0					
10	0	0	0	0	0	0	1	2	6	10	10	10					
11	10	10	10	10	10	10	10	10	10	10	10	10					
12	10	10	10	7	9	10	10	10	10	10	10	10					
13	10	10	10	10	10	10	10	10	8	6	10	10	18	75	11 0	159	00
14	10	10	3	6	2	2	1	1	1	1	0	1					
15	0	0	0	0	1	1	2	2	1	1	1	10	18	75	11 3	158	59
16	7	3	2	10	10	10	10	10	10	10	10	10					
17	6	4	10	10	10	8	5	2	4	6	0	0					
18	0	4	5	10	10	10	10	10	10	3	0	0					
19	0	3	0	2	2	2	2	2	2	1	0	0	18	75	04 8	159	01
20	0	0	0	0	0	0	0	0	0	1	0	0					
21	0	0	0	10	0	4	3	2	2	0	0	0					
22	0	0	0	0	0	0	1	1	1	2	2	2	18	75	06 9	159	00
23	2	7	4	6	5	4	8	4	5	6	7	8					
24	10	7	8	5	1	1	0	1	0	0	0	0					
25	3	7	0	0	1	2	3	2	2	8	2	2	20	75	03 7	159	22
26	1	4	0	6	8	10	10	6	1	1	1	10					
27	10	3	4	8	9	10	3	5	1	2	0	0	20	75	05 9	159	39
28	0	0	0	3	10	5	2	2	2	2	3	0					
29	0	0	1	1	1	1	1	1	1	2	0	0	20	75	05 1	159	28
Mar 1	1	3	0	4	5	6	9	10	2	1	0	0					
2	0	0	0	3	3	7	6	4	5	4	2	2					
3	0	0	0	0	1	0	1	1	1	0	0	0	20	75	06 1	159	27
4	0	0	0	0	1	0	3	3	5	5	5	3					
5	10	4	10	10	10	10	10	10	10	3	3	3					
6	0	10	8	10	10	10	10	10	10	10	10	10					
7	10	10	10	8	10	10	10	10	10	10	1	3	20	75	03 7	159	01
8	7	2	2	1	1	0	0	0	0	0	0	0					
9	0	0	1	0	0	0	0	0	0	1	1	1					
10	0	4	2	7	3	9	8	5	4	2	0	0	20	75	12 3	158	47
11	0	2	1	0	0	0	0	0	0	0	0	0					
12	0	0	0	0	0	0	1	1	1	1	1	1	20	[a]75	11 4	158	37
13	1	0	2	0	2	2	9	1	2	2	1	0					
14	0	0	1	7	9	2	0	0	0	0	0	0	20	75	11 5	158	38
15	0	0	0	0	0	0	0	1	1	1	1	0	12	75	11 3		
16	0	0	2	3	4	3	4	4	6	10	6	10					
17	4	3	1	4	5	5	5	4	2	1	2	3	15	75	12 6	158	45
18	2	4	8	7	1	2	2	6	4	5	5	8					
19	6	6	4	3	3	5	2	1	1	1	1	0	15	75	15 6	158	35
20	0	3	10	10	10	10	10	9	9	10	10	10					
21	10	10	10	10	3	2	1	1	1	1	1	0					
22	0	0	1	1	0	0	0	0	0	0	0	0	15	75	15 4	158	16
23	0	0	0	0	0	0	0	0	0	0	0	0					
24	0	0	2	2	0	0	2	2	7	10	10	8	16	75	18 0	158	04
25	3	10	10	10	10	10	8	0	5	8	10	4					
26	2	3	1	1	1	0	1	2	5	2	5	8	16	75	16 7	158	15
27	4	6	2	2	1	0	0	0	0	0	1	1					
28	1	3	1	1	1	1	1	1	1	1	1	1	16	75	16 8	158	05
29	1	1	1	1	0	0	0	0	0	0	0	1					
30	0	0	0	0	0	0	0	0	0	0	1	0					
31	1	2	0	0	0	0	10	0	0	0	1	2	16	75	17 4	158	01

[a] At 12^h the latitude was 75° 11′6

TABLE 68—*Observations of Aurora Borealis, September 1924 to April 1925*

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Sep 29	22 00–	O			
29	24 00				
30	0 35	Co[a], Cs	2	E–S–W	70–30
30	1 00	G	1	S sky	
30	2 30	O			
Oct 4	20 00	O			
4	22 00	A	2	ENE–NW	15
4	24 00	As	1	E–NW	0–90
5	1 00	A	1	E–Z–W	90
		Cs, Ss	2	N–W	ca30
5	2 00	As	1	E–Z–W	0–90–0
5	2 30	G	1	N	
5	20 00	O			
5	21 30	C	2	NE–N–NW	20
5	22 00				
6	20 00	O			
6	22 00	C	2	NE–N–NW	ca8
		G	1	WNW	15
7	0 00	G	1	NNE–WNW	8
7	2 00	A	1	NE–NW	15
7	3 00	A	1	NE–NW	15
7	4 00	O			
8	0 00	G	1	NE–NW	20
8	1 00	C, Ss	2	E–W	90,10
8	1 30	C	2	W	30
8	2 00	C, Ss	3	W–Z–E, W–N	15
8	3 00	A	2	E–Z–W	90
		C	2	W	
8	4 00	C	1	W	
8	4 45	O			
8	20 00–	O			
8	22 00				
9	0 40	A	1	N	10
9	1 30–	O			
9	4 00				
9	19 00–	O			
9	23 00				
12	0 00–	O			
12	2 00				
24	18 00	As	3	E–Z–W	30–90–45
24	20 00	C	4	E–S–W	70
		A	2	E–W	30–90
24	22 00	A	2	ESE–S–W	60
25	0 00–	A	1	E–Z–W	90
25	2 00				
25	2 20	G	1	NNW	
25	3 00	O			
25	4 00	A	1	N–WNW	25
25	5 00	A	1	NE–WNW	30
25	6 00	O			
25	20 00	4A	2	E–Z–W	15–90–70
25	21 15	As, Cs	2	E–W	15–90
25	22 00	A	2	E–WNW	20,90
26	0 15	G	2	All sky	
26	0 40	G	2	All sky	
26	1 00	G	1	N–NW	
26	1 30	A	2	N	30
26	2 00	A	1	N	
26	3 00	A	1	E–WNW	15
26	4 00	A, Cs	1	E–NW	20–30
26	4 30	O			
29	20 45	O			
29	22 00				
30	0 00	A	2	ENE–NW	8
30	1 00	A	1	ENE–NW	12
30	2 00	A	1	ENE–WNW	20
30	2 30	A	1	ENE–WNW	20

Date	L M T	Form	Intensity	Position	Altitude
1924	*h m*				°
Oct 30	3 15–	O			
30	6 00				
31	20 00	O			
31	22 00	A	1	NE–NW	10
Nov 1	0 00	G	1	NE	10
1	1 00	G	2	NE	10
1	2 00	G	1	NE–N	10
2	16 00–	O			
2	20 00				
2	22 00	A	1	NE–NW	8
4	18 00–	O			
4	21 00				
4	21 30	A	1	NNE–NW	10
4	22 00	A	1	NNE–NW	12
4	22 40	C	2	NNE–NW	15
4	23 00				
5	0 00	A	1	NE–NW	12
5	0 40	A	1	NE–NW	12
5	1 00	A	1	NE–NW	12
		G	1	WNW	15
5	1 40	O			
5	2 00	A	1	NNE–NW	15
5	3 00	A	1	NNE–NW	10
5	4 00	2A	1	NNE–NW	10,15
6	1 00	G	1	NE–NW	10–20
6	2 00				
6	20 00	O			
6	21 00				
6	22 00	A	1	NE–NW	10
7	0 00	A	1	NE–NW	10
7	1 00				
7	1 30–	O			
7	4 00				
7	18 20	A	1	NE–NW	15
8	2 45	O			
8	22 00	O			
9	0 00–	O			
9	2 00				
10	21 00–	O			
11	2 00				
14	0 00	C	3	NE–N–NW	30
14	1 00–	O			
14	2 00				
15	0 20–	O			
15	1 00				
19	21 00	A	1	SE–N–NW	8
19	22 00	A	1	NE–NW	10
20	0 10	A	2	E–S–W	40
		C	3	NW	30
		G	2	ENE–NE	
20	1 00	G	2	All sky	
20	1 30–	G	1	E sky	
20	2 00				
20	3 00–	A	1	S sky	
20	4 00				
20	18 00	O			
20	18 30	A	1	NE–NNW	7
20	20 00	O			
20	21 00	A	2	NE–NNW	8
20	22 00	C	2	NE–NNW	12
21	0 00	A	1	NE–NNW	15
21	1 00				
21	2 00	O			
21	18 00–	O			
21	20 00				
21	21 00	A	1	NE–NNW	10
21	22 00				

[a] Radiation-point $\delta = 58°$, $\alpha = 0^h 37^m$

TABLE 68—*Observations of Aurora Borealis, September 1924 to April 1925*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Nov 22	0 00	*A*	1	NE–NW	8
22	3 00	*A*	1	N	10
22	4 00	*A*	1	NE–NW	15
22	5 00	*A*	1	NE–WNW	15
22	6 00	*A*	1	NE–WNW	18
23	22 00	*A*	1	NE–N	10
24	0 00–	*A*	1	NE–NW	15
24	1 00				
24	2 00–	*O*			
24	6 00				
24	18 00	*O*			
24	20 00	*A*	2	NNE–NW	10
24	22 00	*A*	1	ENE–NNW	15
25	0 10	*A*	1	E–W	20
		C	3	N	25
		G	1	All sky	
25	1 00	*A*	2	E–W	20
		G	1	N	
25	1 30	*A*	3	E–W	20
		Ss	1	NNE, NW, Z	0, 90
25	2 00	*A*	3	E–W	15
		Co	2	N–Z	
		C	2	N	30
25	3 00	*Co*[b]	2	N–Z	
25	4 00	*Co*	2	N–Z	
25	4 30	*G, Cs*	2	E, S sky	0–80
25	5 00	*Cs*	1	E–S	25
25	5 30	*Cs*	2	E–S	45
25	5 55	*Co*[c]	2	N–Z	
25	7 00	*A*	1	NE–NW	
25	8 00	*C*	1	WSW	0–30
		Ss	2	NW	10
25	18 00–	*O*			
25	20 00				
25	22 00	*A*	1	NE–NNW	5
26	20 00–	*O*			
26	22 00				
27	0 30	*A*	1	NE–NW	10
27	2 00–	*A*	1	NE–NW	10
27	3 00				
29	20 00–	*A*	1	ENE–NNW	15
29	21 00				
30	0 00	*G*	1	NE	
30	18 00–	*O*			
30	21 00				
30	22 00	*A*	1	NE–NNW	10
Dec 1	0 00–	*A*	1	NE–NNW	10
1	1 00				
1	2 00	*A*	1	NE–NW	15
1	3 00–	*A*	1	NE–NW	12
1	4 00				
1	5 00–	*O*			
1	6 00				
2	0 30	*G*	1	NE–NW	15
2	4 00	*G*	1	NE–NW	15
2	5 00	*O*			
3	20 00	*O*			
3	22 00	*A*	1	NNE–NNW	5
4	0 00	*A*	2	NE–NW	10
4	1 00	*A*	1	NE–NW	10
4	2 00	*A*	1	NE–NW	10
4	3 00–	*O*			
4	6 00				
5	0 10–	*O*			
5	1 00				
5	2 00	*A*	1	NE–N	15
5	3 00	*A*	1	ENE–NNW	25

Date	L M T	Form	Intensity	Position	Altitude
1924	h m				°
Dec 5	4 00	*A*	1	NE–NW	25
5	5 00–	*O*			
5	6 00				
6	18 00–	*O*			
6	21 00				
7	5 00–	*O*			
7	6 00				
11	20 00–	*O*			
11	22 00				
13	22 00	*O*			
14	18 00–	*O*			
15	4 00				
15	18 00–	*O*			
15	22 00				
16	0 10	*C*	3	ENE–WNW	10
16	1 00	*O*			
16	2 00	*A*	1	NE–NW	8
16	5 00	*A*	1	N	15
21	16 00	*A*	1	ENE–NW	8
21	18 00	*A*	2	E–WNW	10
21	20 00	*A*	3	ENE–WNW	8
		Cs	2	ENE–WNW	15, 30
21	22 00	*A*	2	ENE–WNW	6
		Cs	2	ENE–WNW	15, 25
22	0 00	*O*			
22	1 00	*C*	2	NNE	15
22	2 00	*A*	2	ENE–WNW	35
22	4 00	*A*	1	NE–NW	10
22	5 00	*A*	1	NE–NW	10
22	6 00	*C*	1	NE–NW	10–50
22	16 00–	*O*			
22	22 00				
23	2 00	*A, C*	1	N	10
24	0 10	*G*	2	NE–NW	30
25	0 15	*A*	1	NE–N	10
25	1 00–	*O*			
25	4 00				
26	18 00–	*O*			
26	20 00				
26	22 00	*G*	1	N	8
27	3 00	*A*	1	E	10
27	4 00	*A*	1	E	10
27	5 00	*G*	1	NE–NW	10
27	6 00	*G*	1	ENE–WNW	10
28	3 00–	*O*			
28	4 00				
28	16 00–	*O*			
28	20 00				
28	22 00	*A*	1	NE–N	8
28	23 00	*A*	1	NE–NNW	8
29	0 00	*A*	1	NE–NNW	8
20	1 00	*A*	1	NE–NW	12
29	2 00	*A*	1	NE–NW	20
29	3 00–	*O*			
29	6 00				
30	0 15	*G*	1	ENE	15
30	1 00	*O*			
31	18 00–	*O*			
31	20 00				
31	22 00	*A*	2	NNE–NNW	6
		G	1	NW	0–20
1925					
Jan 1	0 00–	*C*	1	NE–N	10
1	0 30				
1	1 00	*G*	1	NE–N	10
1	2 00	*A*	1	NE–NW	15
1	4 00	*A*	1	NE–NW	12

[b] Radiation-point $\delta = 60°$, $\alpha = 9^h 00^m$ [c] Radiation-point $\delta = 53°$, $\alpha = 9^h 30^m$

TABLE 68—*Observations of Aurora Borealis, September 1924 to April 1925*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1925	*h m*				°
Jan 1	5 00	*A*	1	NE–NW	15
1	6 00	*A*	1	NE–NW	15
1	18 00–	*O*			
1	20 00				
1	22 00	*A*	1	NNE–NNW	5
2	0 00	*O*			
2	1 00	*C*	2	NE–NW	20
2	2 00	*A*	2	NE–NW	ca20
2	3 00	*A*	1	S–E–NW	10–15
2	4 00	*A*	1	NE–NW	12
2	4 30	*A*	1	NE–N	15
2	5 00–	*O*			
2	5 30				
3	2 00	*A*	2	NE–NW	12
3	3 00	*A*	1	NE–NW	12
3	4 00	*O*			
3	5 00	*G*	1	N	10
3	6 00	*A*	1	NE–NW	10
3	7 00	*A*	1	NE–NW	8
3	22 00	*O*			
13	22 00	*A*	1	ENE–NW	20
14	0 15	*A*	1	ENE–N	25
14	0 30	*O*			
14	1 00				
14	1 30	*Cs*	3	N sky	0–90
14	2 00	*O*			
14	2 30	*Cs*	1	ENE–WNW	20
14	3 00–	*O*			
14	3 30				
14	18 00–	*O*			
14	20 00				
14	21 00–	*A*	1	NE–NNW	10
14	22 00				
16	0 00–	*O*			
16	2 00				
16	20 00	*O*			
16	21 30–	*A*	2	NE–NW	10
16	22 00				
17	0 00–	*O*			
17	3 00				
17	4 00	*A*	1	NE–NW	15
17	4 30	*A*	1	NE–NW	15
17	18 00	*A*	1	NE–NW	10
17	20 00	*A*	2	NE–NW	10
		Cs, *Ss*	1	ENE–Z–WNW	20,90
		2*A*	2	NE–NW	8,10
17	22 00	2*A*	1	ENE–Z–WNW	50,90
		Ss	1	NE, NW	0–40
18	0 00	*A*	1	NE–NW	10
18	1 00	*A*	1	NE–NW	15
18	2 00	*A*	2	NE–NW	25
		C	1	NE, NW	ca30
18	2 30	*A*	1	NE–W	20
18	3 30	*A*	1	NE–W	20
18	4 00	*O*			
18	5 00	2*A*	1	NE–NW	10,20
18	6 00	*O*			
18	18 00–	*O*			
18	22 00				
19	0 15–	*G*	1	E	
19	1 00				
19	2 00	*A*	1	NE–WNW	ca15
19	3 00–	*A*	1	ENE–WNW	15
19	4 00				
19	5 00	*A*	1	ENE–WNW	10
19	6 00	*O*			
1925	*h m*				
Jan 19	18 00–	*O*			
19	22 00				
20	0 10	*A*	1	NE–NW	10
20	1 15	*Co*[d], *Cs*	3	All sky	0,90
20	2 00	*Co*, *Cs*	3	All sky	0,90
20	3 00	*G*	1	All sky	0,90
20	4 00	*G*	1	All sky	0.90
20	6 00–	*G*	1	All sky	0,90
20	7 00				
20	8 00	*Co*[e], *Cs*	4	N sky	
20	18 00	*A*	1	NE–NW	10
20	20 00	*A*	1	NE–NW	10
20	22 00	*G*	1	NNE	ca5–12
21	0 00–	*O*			
21	3 00				
21	4 00	*G*	1	All sky	
21	5 00	*G*	1	N	10
21	6 00	*A*	1	NE–NW	15
21	7 00–	*O*			
21	8 00				
21	18 00	*A*	1	NE–N–NW	10
		A	1	SE–S–SW	30
21	22 00	*A*	1	NE–NW	10
22	2 00–	*O*			
22	4 00				
22	5 00–	*A*	1	NE–NW	15
22	6 00				
22	6 30	*G*	1	W	
22	7 00	*A*	1	W	
22	8 00	*O*			
23	3 00	*A*	1	NNE–W	10
23	4 00–	*O*			
23	7 00				
24	0 00	*C*	1	E–NNW	25
24	0 35	*Cs*	3	E–W	ca60
24	1 15	*A*	1	ENE–N	40
		C	1	NE	15
24	2 00	*Cs*	1	NE–W	20–50
24	3 00	*Cs*	1	N sky	15–60
24	4 00	*Cs*	1	N sky	20–40
24	5 00–	*O*			
24	7 00				
25	3 00	*A*	1	NE–NW	
25	4 00	*A*	2	NE–NW	
25	22 00–	*G*	1	E–NW	10
25	24 00				
26	1 00	*A*	1	E–NW	10
26	2 00	*G*	1	E–N	5
26	3 00–	*O*			
26	5 00				
26	18 00–	*O*			
26	20 00				
26	21 00	*A*	1	NE–NW	5
26	22 00–	*O*			
27	1 00				
27	1 30	*C*	1	NE–N	20
27	2 00	*C*	1	NE–N	15
27	2 10	*A*	1	NE–NW	12
27	3 00	*A*	1	NE–NW	7
		G	1	N sky	10–70
27	4 00	*G*	1	NE–NW	5–60
27	5 00	*O*			
28	18 00–	*O*			
29	0 00				
29	1 00	*A*	1	NE–NW	15
29	2 00	*A*	1	NE–NW	30

[d] Radiation-point $\delta = 64°$, $\alpha = 9^h\ 40^m$ [e] Radiation-point $\delta = 71°$, $\alpha = 15^h\ 20^m$

TABLE 68—*Observations of Aurora Borealis, September 1924 to April 1925*—Continued

Date	L M T	Form	Intensity	Position	Altitude
1925	*h m*				°
Jan 29	3 00	*A*	2	NE–NW	15
29	4 00	*A*	1	NE–NW	15
29	5 00	*O*			
29	6 00	*G*	1	NE–N	8
29	7 00	*O*			
29	18 00–	*O*			
29	21 00				
29	22 00–	*A*	1	E–NNW	18
29	24 00				
30	1 00	*C*	1	ENE–NW	
30	2 00	*G*	1	N	
30	3 00	*A*	1	NE–NW	15
30	4 00	*A*	1	NE–NW	12
30	5 00	*O*			
Feb 1	4 30	*O*			
1	5 00	*A*	1	NE–W	28
3	5 00	*O*			
4	5 00	*O*			
4	18 00–	*O*			
5	6 00				
5	18 00–	*O*			
5	24 00				
6	0 00–	*O*			
6	6 00				
6	18 00–	*O*			
7	2 00				
7	18 00–	*O*			
8	4 00				
8	18 00–	*O*			
8	24 00				
9	5 00	*O*			
9	18 00	*C*	2	NE–NW	30
10	2 00	*C*	2	N–NW	30
10	3 00	*O*			
10	4 00				
10	5 00–	1	2	NE–NW	20
10	6 00				
10	18 00–	*O*			
11	4 00				
11	18 00–	*O*			
12	2 00				
12	4 00–	*O*			
12	6 00				
12	18 00–	*O*			
12	23 00				
13	0 00	*C*	3	NE–NW	20
13	1 00	*O*			
13	1 50	*C*	1	E–N	80
13	2 00–	*O*			
13	3 00				
13	4 00	2*A*	2	E W	40, 90
13	5 00–	*O*			
13	6 00				
13	18 00–	*O*			
13	21 00				
16	22 00–	*A*	2	N	15
16	24 00				
17	1 00	*C*	3	NE–NW	20
17	2 00	*A*	2	NE–NW	10
		G	1	NE–NW	10–60
17	2 30	*C*	2	N	10
		G	1	N sky	0–90
17	3 15	*G*	1	NE–NNW	25
17	4 00	*A*	2	NE–NW	15
17	5 00	*A*	1	ENE–NW	10
17	6 00	*G*	1	NNW	10

Date	L M T	Form	Intensity	Position	Altitude
1925	*h m*				°
Feb 17	18 00–	*O*			
17	21 00				
17	21 40	2*A*	2	NNE	10
17	22 00	*A*	2	NE–NW	6
17	23 00	2*A*	2	NE–NW	8, 15
		G, *Ss*	1	NE–NW	0–45
18	0 00	*C*	3	ENE–NW	15–45
		A	1	E–Z–W	90
18	1 00	*C*	2	NNE–NW	20
		G	1	E–Z–W	90
18	2 00	*C*	3	N	15
		G	2	NE–Z–W	90
18	3 00	3*C*	2	E–W	30,90,80
18	4 00	*A*	2	E–Z–W	90
		G	1	N	15
18	5 00	*A*	2	E–Z–W	90
18	6 00	*A*	1	E–N–W	30
18	18 00–	*O*			
18	19 00				
18	20 00	*A*	1	ENE–NNW	10
18	21 00	*A*	1	NE–NNW	10
18	22 00	*A*	2	NE–NNW	10
18	23 00	*C*	2	NE–NW	10
19	0 00	*C*	2	NE–NW	10
19	1 00–	*O*			
19	2 00				
19	3 00	*A*	1	NNE–NW	15
19	4 00	*O*			
20	21 40	*C*	1	NW–Z	
22	22 00	*A*[f]	2	NE–NW	6
22	23 00	*A*	1	NE–NW	6
23	0 00	*A*	1	NE–NW	6
23	1 00–	*O*			
23	2 00				
23	18 00–	*O*			
23	20 00				
23	21 30	*A*	1	NE–NW	7
23	22 00–	*O*			
23	24 00				
24	1 00–	*A*	1	NE–NW	10
24	2 00				
24	3 00	*A*	1	NE–NW	8
24	4 00	*O*			
24	20 00–	*O*			
24	24 00				
25	4 15	*G*	1	ENE–N	10–30
25	5 00	*A*	1	ENE–NW	10
25	6 00	*O*			
25	19 30	*A*	2	E–NW	15
25	20 00	*Cs*	2	ENE–N–WNW	5–90
25	22 00	*A*	1	NE–N	6
		G	2	SE–S–SW	45
25	23 00	*Cs*	2	SE–Z–NW	90
26	0 00	*Cs*	2	SE–Z–NW	90
		G	1	NE–NW	20
26	1 00	*Cs*	1	E–Z–W	90
26	2 00	*G*	1	N	
26	3 00	*A*	1	NE–NW	10
26	4 00	*G*	1	N	8
26	5 00	*O*			
27	0 00–	*O*			
27	5 00				
27	18 00–	*O*			
28	6 00				
28	18 00–	*O*			
28	21 00				

[f] Lower rim red

TABLE 68—*Observations of Aurora Borealis, September 1924 to April 1925*—Concluded

Date	L M T	Form	Intensity	Position	Altitude
1925	*h m*				°
Feb 28	22 00	*A*	2	ENE–N–WNW	15
28	23 00	*Cs*	2	E–W	10, 90
28	24 00	*C*	1	ENE–N–WNW	25
Mar 1	1 00	*A*	1	NE–W	25
1	2 00	*C*	1	E–NW	20
1	3 00	*A*	1	NE–NW	15
1	4 00	*A*	2	NE–NW	30
1	18 00–	*O*			
1	22 00				
1	23 00	*C*	1	NE	10
2	0 00	*O*			
2	1 00	*C*	2	N, E, S, Z	0–90
2	2 00	*G*	1	N, Z	0–90
2	3 00–	*O*	•		
2	4 00				
2	22 00–	*O*			
2	23 00				
3	0 00	*C*	1	NE–NNW	8–15
3	2 00	*A*	1	NE–NW	6
3	3 00	*A*	1	NE–NW	6
3	4 00	*O*			
4	18 00–	*O*			
5	2 00				
5	18 00–	*O*			
5	20 00				
5	21 30	*A*	1	E–N–W	15
5	22 00	*Ss*	1	N	10
5	23 00	*A*	1	N	10
5	24 00	*A*	1	ENE–N–WNW	15
6	1 00	*O*			
6	2 00	*A*	1	E–W	60
		C	1	N	10

Date	L M T	Form	Intensity	Position	Altitude
1925	*h m*				°
Mar 6	3 00–	*O*			
6	4 00				
18	22 00	*G*	1	NE	
19	0 00	*A*	1	NE–NW	10
19	1 00	*A*	1	NE–NW	12
		A	1	NNE–NNW	6
19	2 00	*C*	2	NNE–NW	10
19	3 00	*O*			
20	23 00	2*A*	2	NE–N–NW	15, 20
21	0 00	*C*	2	NE–N–NW	10
21	1 00	*C*	1	E–NW	45
21	2 00	*O*			
23	22 00	*C*	3	SE–N	40
24	0 00	*C*	2	E–NW	60
24	22 00–	*O*			
25	4 00				
26	0 00–	*O*			
26	2 00				
26	18 00–	*O*			
26	23 00				
27	0 00	*C*	2	SE–NW	15
27	1 00	*A*	1	NE–NW	20
27	2 00	*Cs*	1	N sky	0–90
28	0 00	*G*	1	NE–N	10
30	18 00–	*O*			
30	24 00				
Apr 2	0 00	*Cs*	2	NE •	15
4	18 00–	*O*			
4	24 00				
6	0 00	*Cs*	4	E–N–W	40–80

TABLE 69—*Cloudiness on Scale 0 to 10, September 1924 to March 1925*[a]

Date	Local mean time in hours												Date	Local mean time in hours											
	0	2	4	6	8	10	12	14	16	18	20	22		0	2	4	6	8	10	12	14	16	18	20	22
1924													*1924*												
Oct 1	5	10	10	10	10	10	10	10	10	,9	7	10	Oct 26	3	3	2	1	10	10	6	8	10	1	2	10
2	1	1	2	1	1	1	2	3	1	10	10	10	27	10	10	3	3	3	6	10	10	10	10	10	10
3	10	10	10	10	9	10	10	10	10	10	10	10	28	10	10	10	10	10	4	3	8	10	10	10	8
4	10	10	10	10	10	9	7	8	4	3	3	1	29	4	6	4	7	10	10	10	10	10	10	10	8
5	4	6	5	10	8	6	3	2	2	3	2	1	30	2	2	3	2	2	2	2	7	10	10	10	10
6	10	1	10	10	10	10	10	10	3	2	1	1	31	10	10	10	10	9	10	2	1	1	1	0	0
7	0	0	0	1	9	10	8	10	10	10	10	10	Nov 1	1	4	10	10	10	10	10	4	3	1	2	10
8	5	0	0	1	2	1	1	1	1	3	4	1	2	10	10	10	2	1	1	0	1	0	0	0	0
9	1	1	1	3	9	6	3	3	2	3	1	3	3	4	10	5	10	10	10	8	10	10	10	10	10
10	3	2	4	4	2	6	7	4	5	4	0	2	4	10	10	10	10	10	10	9	9	2	1	0	0
11	2	2	7	6	7	10	4	2	2	2	1	1	5	0	3	0	3	7	8	10	10	10	10	10	10
12	2	2	1	1	4	6	3	3	7	7	4	4	6	10	2	10	10	10	10	10	10	10	0	0	0
13	3	3	2	5	7	6	10	10	10	10	10	10	7	2	0	1	1	1	2	1	2	2	2	2	10
14	10	10	10	10	10	10	10	10	10	10	10	10	8	10	10	10	4	6	2	10	6	10	10	6	2
15	10	10	10	10	10	10	10	10	10	10	10	10	9	7	6	2	7	10	10	10	5	10	10	10	10
16	10	10	10	10	9	9	9	10	9	10	10	9	10	10	10	10	2	2	6	4	9	10	6	7	7
17	4	8	3	1	2	8	9	10	10	10	10	9	11	3	1	1	1	2	1	4	3	2	1	8	7
18	5	10	10	10	10	10	10	10	10	10	10	10	12	10	10	10	10	10	10	10	10	10	10	10	10
19	10	10	10	10	10	10	10	10	10	10	10	10	13	10	10	4	10	10	10	10	10	10	10	10	8
20	10	10	10	10	4	10	7	1	2	2	1	1	14	8	5	8	2	1	2	10	10	10	2	1	2
21	4	10	10	10	10	2	1	2	9	1	2	10	15	1	10	5	10	10	10	10	10	10	7	10	10
22	10	10	10	10	10	10	10	10	10	10	10	10	16	10	10	9	10	10	10	10	10	10	10	10	10
23	10	10	10	10	9	9	9	10	10	10	10	10	17	10	10	10	10	10	10	10	10	10	9	3	10
24	10	10	9	10	10	10	10	10	10	2	1	1	18	10	10	8	3	10	10	10	10	10	2	3	3
25	2	1	2	0	3	6	3	2	1	1	1	1	19	9	5	8	5	10	10	10	10	3	2	3	2

[a] During this entire period, observations were made at the winter-quarters in latitude 170° 43′2 north and in longitude 162° 25′0 east.

TABLE 69—*Cloudiness on Scale 0 to 10, September 1924 to March 1925*—Concluded

Date	Local mean time in hours											
	0	2	4	6	8	10	12	14	16	18	20	22
1924												
Nov 20	2	1	3	8	3	2	1	1	1	0	0	0
21	2	4	2	1	2	2	2	2	1	0	0	0
22	0	0	5	1	6	4	4	10	10	10	10	10
23	10	3	5	3	4	4	10	8	6	3	3	3
24	3	2	4	2	2	6	6	10	2	2	2	2
25	2	2	4	0	0	0	0	0	0	1	0	1
26	0	0	0	1	1	1	1	1	8	9	1	1
27	0	0	2	2	10	9	9	10	7	9	10	10
28	8	10	10	8	10	10	10	10	10	10	10	10
29	10	10	10	10	10	10	10	10	10	10	7	8
30	8	10	10	10	9	9	10	1	1	1	0	0
Dec 1	0	0	0	1	0	0	1	1	1	10	10	10
2	8	10	1	3	9	10	10	10	10	10	10	10
3	10	10	10	10	10	8	7	7	2	4	4	4
4	2	3	7	6	10	10	10	10	10	10	10	10
5	2	2	2	0	3	10	10	10	10	10	5	10
6	10	10	10	10	10	10	3	2	1	1	10	10
7	10	10	3	2	9	10	2	10	6	2	10	10
8	10	10	10	10	9	10	10	10	10	10	8	7
9	10	5	4	10	9	10	10	10	10	10	10	10
10	10	10	10	10	1	10	10	10	10	10	10	10
11	10	10	3	9	9	9	8	8	7	3	5	3
12	4	10	1	2	4	4	7	3	2	2	8	10
13	10	10	10	10	10	10	9	10	10	10	5	2
14	7	10	10	3	1	1	1	0	0	0	0	0
15	0	1	6	0	0	0	2	1	1	0	0	0
16	0	0	0	1	1	1	8	6	10	10	10	10
17	10	10	10	10	10	9	10	10	10	10	10	10
18	10	10	10	10	10	10	10	10	10	10	10	10
19	10	10	10	10	10	10	10	7	10	10	10	10
20	10	8	10	4	9	9	9	10	10	10	10	6
21	8	10	10	10	10	10	10	10	10	0	0	1
22	10	2	10	2	9	1	1	1	1	0	0	0
23	10	3	8	10	10	10	10	10	10	2	10	6
24	7	10	8	5	6	10	9	10	3	7	6	5
25	2	2	2	10	10	10	8	6	10	10	10	10
26	7	3	0	1	10	0	8	2	2	2	1	0
27	3	3	1	3	10	10	10	10	10	10	10	10
28	10	10	2	4	4	4	2	2	1	0	0	1
29	1	1	2	0	1	3	10	10	10	10	10	8
30	4	6	10	10	10	10	10	10	10	10	10	10
31	6	4	5	9	1	2	2	0	0	0	0	0
1925												
Jan 1	0	0	9	2	1	2	2	2	1	0	0	1
2	1	2	3	7	10	10	10	10	10	10	7	10
3	10	1	1	3	9	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	8	4	3	8	9	10	10	10	10
8	10	10	10	10	5	10	10	10	10	10	8	10
9	10	10	10	10	10	8	10	6	10	10	10	10
10	7	10	10	10	10	10	10	10	10	8	10	10
11	10	10	9	7	8	10	10	10	10	10	10	10
12	10	10	10	4	8	10	10	10	10	10	10	10
13	10	10	10	10	9	6	10	10	3	10	10	1
14	1	1	0	0	3	2	1	2	1	1	0	0
15	8	10	10	8	10	10	3	6	3	3	4	3
16	0	0	8	4	10	10	10	10	5	3	2	0
17	3	1	1	0	0	0	1	1	1	0	0	0
18	5	2	2	1	1	1	1	2	1	1	0	1
19	1	1	1	1	1	2	2	2	1	0	0	0
20	0	0	0	0	0	2	3	2	1	1	0	0
21	0	0	0	0	1	1	2	3	1	0	0	0
22	0	0	0	2	0	4	10	10	10	10	10	10
23	10	10	4	3	2	2	2	2	2	2	1	0
24	0	1	10	2	5	10	10	10	10	10	10	10

Date	Local mean time in hours											
	0	2	4	6	8	10	12	14	16	18	20	22
1925												
Jan 25	10	6	2	1	1	5	10	10	10	10	3	0
26	0	0	0	0	1	10	10	8	6	5	2	0
27	0	0	0	2	9	10	10	10	10	10	10	10
28	10	10	6	10	10	10	10	10	10	10	10	0
29	0	2	0	0	1	1	2	2	2	2	2	1
30	0	0	0	10	10	10	10	10	10	10	10	10
31	10	10	9	3	9	4	6	3	4	4	10	10
Feb 1	10	10	10	3	8	7	8	8	10	10	10	3
2	4	6	4	2	9	10	10	10	10	10	10	10
3	10	5	5	4	8	9	10	5	4	3	10	10
4	6	3	2	0	1	1	1	2	2	2	1	1
5	1	2	2	2	1	2	3	3	3	3	2	0
6	0	0	0	2	3	4	5	4	7	5	5	1
7	2	5	6	3	3	6	7	3	2	3	4	3
8	4	3	3	2	2	2	3	3	3	2	1	1
9	1	2	0	0	3	0	0	0	0	0	0	0
10	0	0	0	0	1	3	4	3	3	2	3	1
11	0	0	0	0	2	0	1	1	1	1	1	0
12	1	3	2	3	3	1	1	1	4	3	4	2
13	1	2	2	1	8	10	3	8	10	10	10	10
14	10	10	10	10	10	10	10	10	10	10	10	10
15	10	10	9	2	10	10	10	10	10	10	10	10
16	10	10	10	10	10	10	10	10	10	2	1	1
17	1	0	4	0	0	0	0	0	0	0	0	0
18	0	0	0	0	1	1	1	1	1	1	0	0
19	0	2	0	1	1	1	9	10	10	2	10	10
20	10	10	10	10	10	10	10	10	10	10	7	10
21	4	3	10	10	10	10	4	8	10	10	10	10
22	10	10	10	10	10	9	9	7	8	9	10	0
23	0	3	7	10	10	10	10	3	1	1	1	0
24	0	0	0	1	2	3	8	4	10	10	3	0
25	0	4	0	3	9	6	1	0	0	0	0	0
26	0	0	0	4	10	10	10	10	10	10	3	10
27	1	1	1	4	2	1	1	0	0	0	0	0
28	0	0	0	2	10	10	10	2	5	10	2	1
Mar 1	1	0	0	1	0	0	6	10	6	2	3	3
2	4	0	0	3	10	5	2	1	0	0	1	0
3	0	0	1	2	1	0	1	1	1	1	0	0
4	5	9	8	10	10	1	0	0	0	0	0	0
5	0	0	0	2	0	0	0	0	0	1	0	0
6	0	0	2	3	10	10	2	10	3	3	2	3
7	8	3	4	4	6	7	4	8	10	10	10	10
8	5	2	3	6	10	10	10	10	10	10	10	10
9	1	8	7	10	9	10	10	10	10	10	10	7
10	10	6	8	8	9	4	1	1	3	8	5	4
11	10	8	10	9	9	5	8	10	10	10	10	10
12	10	10	5	9	8	6	8	7	9	10	10	10
13	10	10	10	2	2	8	4	10	10	10	10	2
14	10	8	9	10	2	1	1	1	2	10	10	10
15	10	10	10	10	10	7	5	8	10	10	10	10
16	10	10	8	1	1	6	10	10	2	1	1	10
17	10	10	10	10	10	10	9	6	1	1	2	10
18	10	10	10	10	10	10	10	10	6	10	10	1
19	1	0	10	10	10	1	3	2	4	8	10	10
20	10	10	10	10	10	10	10	10	7	2	2	1
21	1	1	10	10	10	10	10	10	9	8	10	10
22	2	6	4	5	10	4	6	10	10	7	8	4
23	3	10	10	10	10	10	10	10	8	7	8	1
24	1	10	10	10	10	10	3	1	0	0	0	0
25	0	0	0	1	1	2	2	1	10	10	4	3
26	5	2	4	1	1	1	0	0	0	0	0	0
27	0	0	0	0	1	0	0	0	0	0	0	5
28	2	3	2	10	3	3	10	3	0	0	0	1
29	1	0	2	1	2	2	1	1	0	0	0	0
30	0	2	0	3	0	0	1	2	3	3	3	3
31	3	3	3	10	9	5	2	2	1	1	0	0

amount of clouds. A few nights of cloudiness 10 are included, however, among the "clear nights" discussed, these being cases where the original notation is 10*, meaning that the sky was covered with very thin clouds through which aurora generally could be seen. The adopted character-number is best illustrated by an example. The brightness of each of the forms, glow, arch, curtain, streamer, and corona (the last two considered as one group) was entered for every hour of the night as in Table 70. The total of brightness thus entered represents the character-number for the night, thus, for example, the character-number for the night of January 2–3, 1924, as shown in Table 70, is 19.

TABLE 70—*Example to Show Definition of Auroral Character-Number*

Form	Brightness of form observed, January 2 to 3, 1924, at local mean time hours									Sum
	22	23	24	1	2	3	4	5	6	
G	0	0	2	0	0	1	2	2	0	7
A	0	2	0	0	0	0	0	0	0	2
C	2	0	0	2	2	0	0	2	0	8
St, *Co*	0	0	0	0	0	2	0	0	0	2
Total = auroral character-number										19

Evidently this character-number is very complicated, because it takes into account the number of forms, the brightness of the forms, and the number of full hours at which

TABLE 71—*Auroral Character-Numbers on Clear Nights*

Date	Half-year																	
	1922 to 1923						1923 to 1924						1924 to 1925					
	Oct	Nov	Dec	Jan	Feb	Mar	Oct	Nov	Dec	Jan	Feb	Mar	Oct	Nov	Dec	Jan	Feb	Mar
1–2				0	0	2					9	2				7		4
2–3				3	0	0				19	0	13						3
3–4				1	6			5	15		10	19			5			
4–5		0				1			16	17	20			9			0	0
5–6			11		13				16	14	29						0	5
6–7		3			0			19	20	19	19			3				0
7–8									5	19	14	11					0	
8–9			9						7	7		18	1				0	
9–10		8			10	2			7	13	16	13	0				6	
10–11		9				5		3	25	25		15		0			0	
11–12			1	15	8	11		2	15	6		18	0				0	
12–13	18			17	4				25	13		6	0				5	
13–14				16		8		17		0		4						
14–15			16	9		18		9	10	2	4	4			0			
15–16		5				17				9		5			5	0		
16–17		6	5		15	7			1							3	16	
17–18		24	19	8	23			11	2							10	26	
18–19		20	9		7	4		0	2		1					6	7	
19–20	4	25				11		0	1		9			13		16		
20–21		2		0	18				4	0	17			4		4		
21–22				5						6	1	1		6	11	3		
22–23		14		4		10				6		1						
23–24			4	21		4				11		4				6	2	
24–25	10	17	7	20		7			5		8		8	23			2	0
25–26	21		4		13			0		2	11		9	1		5	12	0
26–27					10				8					1	5	4		4
27–28		11	17			2					14	6					0	1
28–29									6		9	0			5	6	10	0
29–30		22	7	1						16	7	0	4			7		0
30–31		0		2				7		17		0		6				0
31–32			1	0			9		6	4					9			0

auroras were observed during the night However, it serves well as a rough representation of the total intensity of an auroral display during a night Table 71 contains these auroral character-numbers for every clear night of the three half-years from which observations of the aurora are available

(2) CHARACTERISTIC FEATURES DEPENDING UPON THE GEOGRAPHIC POSITION OF THE OBSERVING STATION

An examination of the auroral observations reveals characteristic differences from year to year, especially between the observations from the first two winters on the one hand and the last winter on the other hand These differences appear to be so closely related to the differences in the geographic latitude from winter to winter that they undoubtedly show the variations of the auroral displays with latitude in the region around 160° east of Greenwich However, it is well to bear in mind that the observations are not simultaneous and that, therefore, variations from year to year may also be included in the figures which are to be discussed

The observations were made from a fixed station only during the winter of 1924–25 During the two winters of 1922–23 and 1923–24 the *Maud* was drifting with the ice and the position was changing from day to day During these winters, however, the drift was always slow, except in the month of October No material error will be introduced by regarding the observations as taken from the points represented by the average positions for the periods These average positions for the two winters in the drift-ice and the fixed position of the last winter-quarters are entered in Table 72

TABLE 72—*Geographic Positions during Periods with Auroral Observations*

Period	North latitude	East longitude
	°	°
October 1922 to March 1923	73 6	172 2
October 1923 to March 1924	75 1	159 5
October 1924 to March 1925	70 7	162 4

In the following tables all data are arranged according to the geographic latitude and not chronologically

(3) AURORAL FREQUENCY

A measure for the frequency of the aurora can be found from Table 71, containing the auroral character-numbers. From this table we find for each winter the total number of clear nights and the number of clear nights with aurora, whence we find the auroral frequency defined as the percentage-occurrence of clear nights with aurora referred to the total number of clear nights The numbers and frequencies thus found are compiled in Table 73, in which also the mean auroral character-numbers for the three winters are entered. From the table it is seen that the auroral frequency and the character-number

TABLE 73—*Auroral Frequency and Character-Numbers in the Periods October to March*

North latitude	East longitude	Number of clear nights	Number of clear nights with aurora	Auroral frequency	Auroral character-number
°	°			*per cent*	
75 1	159 5	90	81	90	9 3
73 6	172 2	78	69	88	8 8
70 7	162 4	66	45	68	4 7

decrease with decreasing latitude The difference between the two most northerly latitudes is not marked, indicating that the observations in these latitudes were taken not far from the zone of maximum frequency.

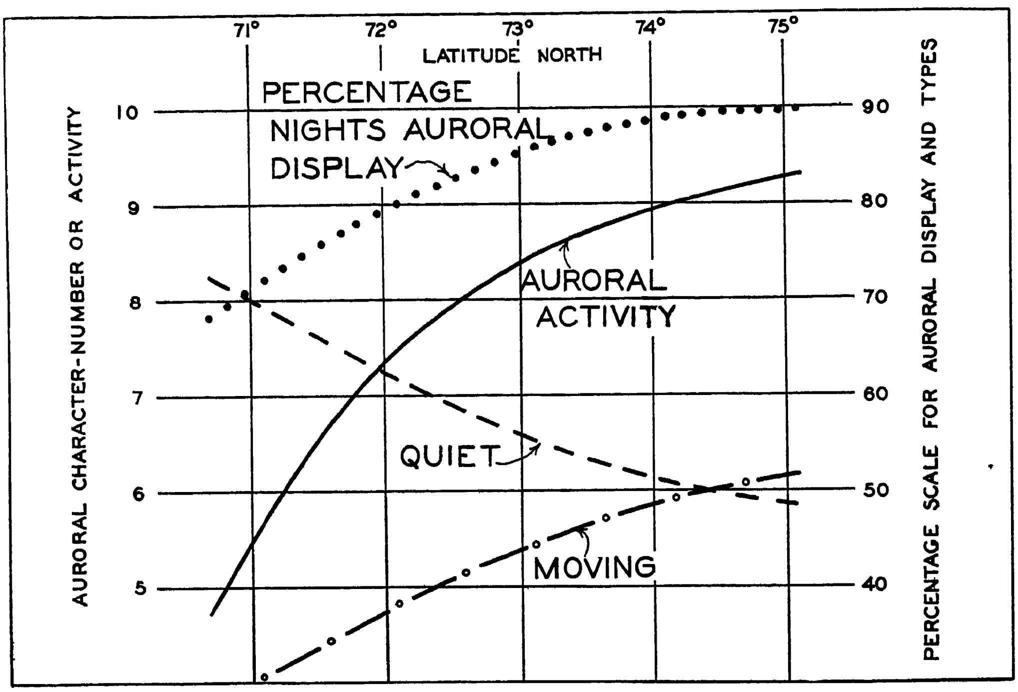


FIG 38—Auroral variations with latitude off north coast Siberia

It is of interest to note that the character-number decreases more rapidly with latitude than the frequency, because this shows that the auroral displays become less intense when going south

(4) PERCENTAGE-OCCURRENCE OF AURORA OF THE DIFFERENT GRADES OF BRIGHTNESS AND OF DIFFERENT FORMS

An examination of the auroral frequency of the various grades of brightness according to the arbitrary scale used shows that the brightness decreases with latitude The number of occasions expressed in per cent of the total number of observations on which the brightness was indicated as faint, moderate, strong, or brilliant show the values as entered in Table 74

TABLE 74—*Percentage-Occurrence of Aurora of Different Brightness*

North latitude	East longitude	Brightness			
		Faint	Moderate	Strong	Brilliant
°	°	*per cent*	*per cent*	*per cent*	*per cent*
75 1	159 5	28 6	62 0	8 2	1 2
73 6	172 2	31 4	60 4	7 4	0 8
70 7	162 4	66 2	26 4	6 3	1 1

It is evident that the aurora becomes more and more faint the farther south we move within this region, but again we find that the difference is not very marked between the two most northerly locations.

Notes regarding remarkably colored forms are not frequent For latitude 75°1 there are 13 notes, for 73°6 there are 19, and for 70°7 there is only one. Rapidly moving forms were noted apparently still more rarely, namely, 3, 14, and 0 times, respectively However, it must be remembered that the terms "unusual color" and "unusual movement" are so vague that they leave everything to the judgment of the observer It is characteristic that most notes of this type were made during the first winter in latitude 73°6, when the brilliant auroral displays were yet novel to most of the observers, who, therefore, at that time would call phenomena "unusual" which later they would regard as ordinary.

There is also a very marked variation with latitude in the relative frequency of the various forms of the aurora, which is evident from Table 75

TABLE 75—*Percentage-Occurrence of the Auroral Forms*

North latitude	East longitude	Type					Quiet forms	Moving forms
		G	*A*	*C*	*S*	*Co*		
°	°	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
75 1	159 5	19 8	28 6	42 2	7 5	1 9	48 4	51 6
73 6	172 2	21 2	31 4	34 5	11 6	1 3	52 6	47 4
70 7	162 4	17 5	55 3	22 4	2 5	2 3	72 8	27 2

The striking feature is that with decreasing latitude the number of quiet forms increases, while the number of moving forms decreases; at the two northerly locations the aurora curtains are dominating, but at the southerly the arches are by far the most frequent This result is in good agreement with observations from still more southerly stations in the same region At Pitlekai, in north latitude 67° 06′ and east longitude 186° 29′, where the *Vega* wintered from 1878 to 1879, A E. Nordenskiold describes the typical aurora as a low arch to the north, and at Cape Serdze Kamen, 50 miles east of Pitlekai, where the *Maud* was in 1920 to 1921, a low arch to the north was frequently seen, while other forms seldom occurred

(5) OCCURRENCE OF AURORA IN THE SKY

The occurrence in the sky also shows characteristic variations with latitude. In order to examine this, the sky was divided in five segments, one called zenith, corresponding to the central part of the sky from zenith to 60° above the horizon, and four from altitude 60° to the horizon, representing the north, east, south, and west sky, respectively The number of cases in which auroras were observed within any of these segments at the full hours between 22^h and 6^h on clear nights was found from the tables of observations and expressed in per cent of the total number of observed auroras The results are shown in Table 76, in which, for instance, 72 per cent in north segment in latitude 75° means that 72 per cent of the auroras observed at the stated hour were seen in the segment called north.

TABLE 76—*Percentage-Occurrence of Aurora Within Five Sky-Segments*

North latitude	Segment					Difference	
	N	*E*	*S*	*W*	*Z*	N–S	E–W
°	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
75 1	72	81	45	74	40	27	7
73 6	69	81	31	73	44	38	8
70 7	89	84	11	77	17	78	7

The most interesting result of this investigation is that the auroral display in the southern sky decreases rapidly with decreasing latitude, while the displays in the east and west remain constant It also appears that auroras are most frequent in the east and west of the two northerly locations, but most frequent in the north at the southern station With a broad generalization, the figures in Table 76 may be interpreted to the effect that the auroras in the region concerned have the character of a band extending from east to west or, since the frequency is somewhat greater in the east than in the west, a band which is perpendicular to a direction directed slightly east of north The band has a great width in north-south direction, but appears at the southerly station in latitude 70°7 so low that it passes across the northern sky Proceeding to the north, it rises more and more above the horizon, until in latitude 75°1 it approaches the zenith It may be assumed that at the zone of maximum frequency the auroras occur just as often on the southern as on the northern sky From the values in Table 76, a rough extrapolation indicates that the difference between occurrence in the north and in the south segment will disappear between latitudes 77° and 78° It may be concluded, therefore, that the zone of maximum frequency in longitude 160° east of Greenwich falls between latitudes 77° and 78° north.

(6) CHARACTERISTICS OF ARCHES AND CORONAS

We shall finally examine the orientation and altitude of the arches and the positions of the radiation-points of the coronas For each winter the arches were tabulated in four groups, according to the altitude of the summit reckoned from the north horizon, namely, of altitudes less than 60°, between 60° and 90°, between 90° and 120°, and more than 120°. The last two groups comprise the arches which pass over the southern sky For each group the mean altitude of the summit of the arch and its azimuth reckoned from the south were computed

TABLE 77—*Altitudes and Azimuths of Summits of Arches*

Altitude	Latitude and longitude								
	75°1 N, 159°5 E			73°6 N, 172°2 E			70°7 N, 162°4 E		
	No	Alt	Az	No	Alt	Az	No	Alt	Az
		°	°		°	°		°	°
Less than 60°	112	27	184	110	30	188	164	14	182
From 60° to 90°	99	83	183	116	86	183	15	88	180
From 90° to 120°	18	111	180	29	107	182	2	115	186
More than 120°	64	156	180	29	150	183	4	160	186
Totals and means	293	79 9	183	284	72 9	187	185	24 1	182
Magnetic meridian			183			187			180

Only the observations which give the directions to the end-points of the arches and the altitudes of the summits were utilized Most of the arches cross from the eastern to the western sky, but a few run from a point on the eastern sky to the north or south or from the north or south to a point on the western sky Not a single one is found entirely on the eastern or the western sky. Therefore, it is always possible to discriminate between the eastern and the western end-points of the arches, and the mean directions to these points were computed for each group as the arithmetical mean of the single directions, reckoned in degrees from the south through west The azimuth of the summit was defined as the mean of the azimuths to the end-points The altitude represents the mean altitude over the northern horizon.

Table 77 shows that the number of arches in the southern sky decreases with decreasing latitude and also that the azimuth of the summit of the arch is practically independent of the altitude of the summit. From the mean of all observed arches it appears that a greater number of arches were observed at the two northerly locations and that the mean altitude of the summit decreases rapidly with decreasing latitude. The mean azimuth to the summit is practically the same at all locations, but shows a small variation from one location to another in agreement with the variation of the magnetic meridian. From the azimuth of the north magnetic meridian it is seen that the arches run practically perpendicular to the magnetic meridian at all locations.

The number of coronas which were observed is surprisingly small. A corona was noted twelve times in 1922–23, twenty times in 1923–24, and eight times in 1924–25. On these occasions the radiation-point could be determined with any certainty only six, twelve, and five times, respectively. The radiation-point was observed by making a sketch of the position of the point relative to known stars, the declination and right ascension of the point being determined later from a star-chart. Knowing the time of observation, the hour-angle of the radiation-point could be computed by means of the right ascension. It was found at numerous stations that the radiation-point lies close to the magnetic zenith, defined as the direction toward which the south end (upper end) of an inclination-needle points when orientated in the magnetic meridian. The magnetic zenith is not a fixed point, but varies according to variations in inclination and declination. However, these variations are small, and we, therefore, should expect that the declination and the hour-angle of the radiation-point were subject to small changes only, but the observations show for all three periods a wide range which probably arose from errors of observation. Mean values were derived for each period by plotting the observed points on a stereographic polar map and determining the mean point graphically. From the mean declinations and hour-angles the altitudes and azimuths of the radiation-point were computed as shown in Table 78, together with the altitudes and azimuths of the magnetic zenith. It appears that the radiation-point always lies below and to the west of the magnetic zenith. This is in agreement with what has been found at other stations, though the differences appear to be greater in the region we deal with than elsewhere. However, our observations are few and the single values scattered, for which reason no great weight can be attributed to the magnitude of the observed differences. The 12 values for latitude 75°1 show the smallest scattering and, therefore, are probably the most trustworthy, the four values for latitude 70°7 disagree considerably among themselves and are probably the least trustworthy.

TABLE 78—*Altitude and Azimuth of the Radiation-Point and of the Magnetic Zenith*

North latitude	Radiation-point		Magnetic zenith		Number of observations
	Altitude	Azimuth from south	Altitude	Azimuth from south	
°	°	°	°	°	
75.1	81.0	10.8	82.6	2.7	12
73.6	78.7	23.8	81.6	7.6	6
70.7	77.8	36	79	0	4[a]

[a] Omitting one observation marked doubtful, if retained the means for radiation-point altitude and azimuth are 80°4 and 25°, respectively.

(7) PERIODICITY OF THE AURORA

(*a*) *Annual period*—The observations of aurora were naturally limited to the winter half-year and can not give, therefore, any conclusive information regarding an annual period of the aurora. However, we can examine the evidence for such a period which is

contained in the half-year's observations From Table 71 the numbers of clear nights in every winter month and the numbers of clear nights with aurora were compiled as in Table 79. This table also contains the percentage of clear nights on which auroras were observed and the mean auroral character-number for the clear nights

TABLE 79—*Variations of the Aurora during the Winter*

Description	North lat	East long	Month					
			Oct	Nov	Dec	Jan	Feb	Mar
	°	°						
Number of clear nights	75 1	159 5	1	11	20	21	18	19
	73 6	172 2	4	15	13	16	14	16
	70 7	162 4	7	10	7	13	16	13
Clear nights with aurora	75 1	159 5	1	8	20	19	17	16
	73 6	172 2	4	13	13	13	11	15
	70 7	162 4	4	9	6	12	9	5
Percentage of clear nights with aurora	75 1	159 5	100	73	100	90	94	84
	73 6	172 2	100	86	100	81	79	94
	70 7	162 4	57	90	86	92	56	38
Mean auroral character-number	75 1	159 5	9 0	6 6	9 8	10 7	11 0	7 4
	73 6	172 2	13 2	11 1	8 5	7 6	9 1	6 8
	70 7	162 4	3 1	6 6	5 7	5 9	5 4	1 3

From this table it is seen that there is a marked difference in the frequency of the aurora in the two northerly locations and the southerly At the northerly location there appears no systematic variation of the auroral frequency from month to month In both winters the aurora was observed in the average on nine of ten clear nights However, in the southerly latitude (70°7 north) a pronounced maximum of the auroral frequency occurs in the middle of the winter In November, December, and January the frequency was as great as it was farther north, but in October and in February and March it is much smaller. The auroral character-numbers show similar features In the northerly latitudes the mean character-numbers run irregularly from month to month, averaging 9 3 and 8 8, respectively, but at the southerly station the greatest values were around midwinter, with an average for the whole period of 4 7 (see Table 73) It may be noted that the character-numbers in midwinter are much smaller at the southerly station than at the two northerly ones, though the frequency is equal This again shows that the displays farther south are less brilliant and last a shorter time

(*b*) *Variation of the auroral frequency during the night*—When the variation of the frequency during the night is to be discussed, there is the difficulty that the observations were taken systematically only between 22^h and 6^h by the regular night watchmen It would not be advisable to extend the examination of the frequency beyond 6^h, because at the end of March the Sun rose about this hour and even in October and February the twilight made doubtful auroral observations after 6^h. However, it would be desirable to have had complete observations from 18^h to 6^h, but the notes regarding the aurora between 18^h and 22^h are not as systematic as desired These observations were taken by F. Malmgren and the writer, but other duties frequently interfered This circumstance makes the investigations more difficult It is necessary to examine separately the nights from which observations only from 22^h to 6^h are available, the "incomplete" nights, and the "complete" nights on which notes were made after 18^h The results from the latter can be used for amplifying the results from the former An investigation of the variation during the night has to be confined to conditions during clear nights. The rule was followed that if an observation was lacking at the full hour, but taken within 25 minutes from the full hour, then this observation was used During the "complete"

nights the hours 19 and 21 were omitted, because observations had often been taken at 18ʰ and 20ʰ only, and during the last winter the record at 23ʰ was left out, since our native cabin-boy had the watch at this hour for a period.

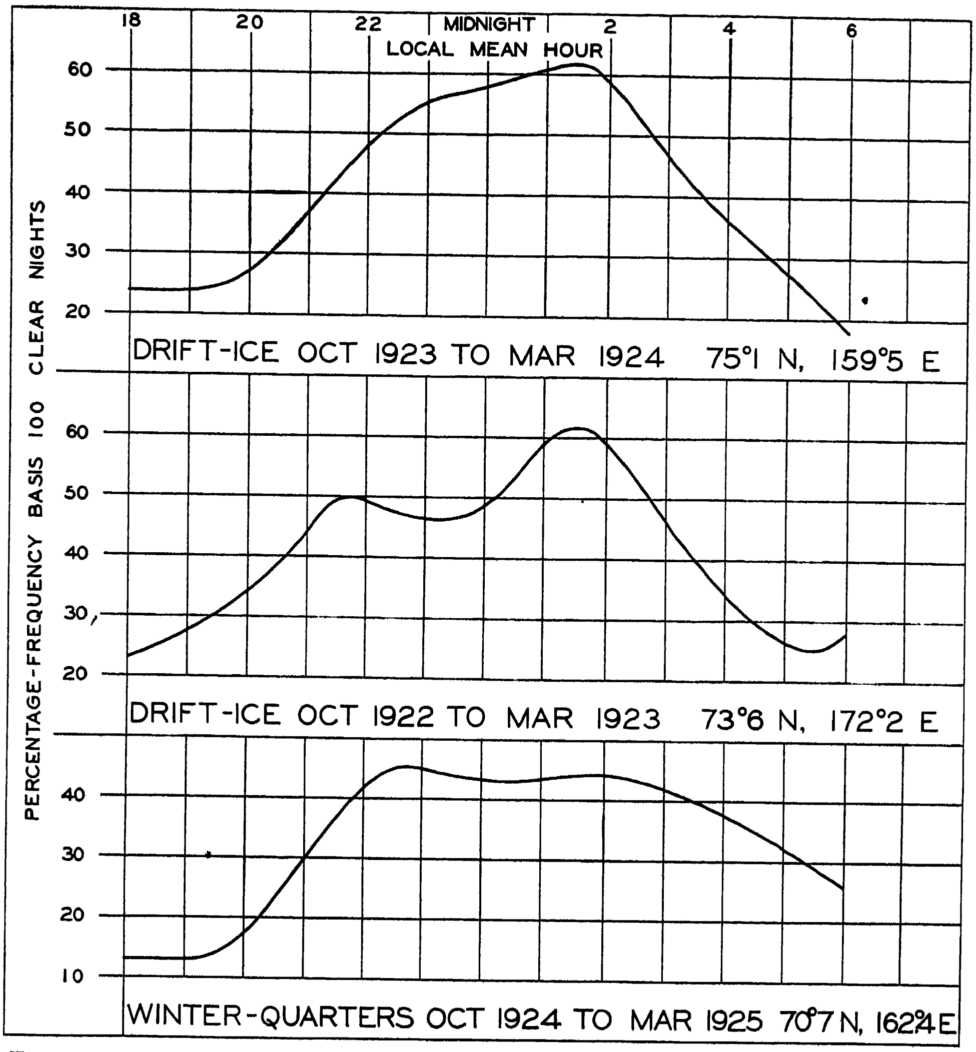


FIG 39—Variation of auroral frequency at night off Siberian coast, three winters 1922 to 1925
[Smoothed means — $(a + 2b + c)/4$]

Table 80 contains the percentage frequency of the aurora on clear nights, the upper part being derived from the "incomplete," the lower from the "complete" nights The numbers were derived by first determining the frequency on clear nights when aurora was observed and then multiplying the number for latitudes 75°1, 73°6, and 70°7 by 0.90, 0 88, and 0.68, respectively, these factors representing the ratio between clear nights with aurora and the total number of clear nights (see Table 73) The values are shown graphically in Figure 39 From the table and, still better, from the figure, it is seen that there is a pronounced variation of the frequency during the night, the greatest number of aurora occurring between 22ʰ and 2ʰ The number of auroras between 22ʰ and 6ʰ is apparently smaller at the uneven hours than at the even This is undoubtedly so because the observers occasionally omitted the observations at the uneven hours, which was not the case at the even hours because the watch was changed then.

The frequency between 22^h and 2^h decreased from north to south In latitude 75°1 it averaged 59 per cent, meaning that on clear nights aurora was seen at any time between 22^h and 2^h in 59 of 100 cases, in latitude 73°6 it is 54 per cent, and in latitude 70°7 it is 40 per cent. The frequency at 18^h and 16^h remains almost constant, about 20 per cent, in such a way that the range of the variation during the night decreases from north to south The fact that the maximum frequency falls near local midnight is in agreement with Vegard's conclusion, namely, that the maximum frequency occurs near magnetic midnight because the magnetic and the astronomic meridian almost coincide in the region of observation

TABLE 80—*Percentage-Variation of Auroral Frequency during the Night*

Description	North lat	East long	Local mean time in hours													Number of nights with aurora
			18	19	20	21	22	23	24	1	2	3	4	5	6	
	°	°														
"Incomplete" nights	75 1	159 5					55	59	67	53	59	44	35	22	20	81
	73 6	172 2					55	46	54	56	57	37	29	14	19	69
	70 7	162 4					39	(40)	41	38	44	33	35	21	18	45
"Complete" nights	75 1	159 5	24	(24)	24	(37)	51	54	63	54	72	39	39	27	18	30
	73 6	172 2	23	(28)	32	(44)	56	42	46	60	70	37	42	18	28	19
	70 7	162 4	13	(13)	13	(30)	46	(45)	44	40	50	37	42	31	26	31

TABLE 81—*Variation during the Night of the Percentage-Frequency of the Various Forms of Aurora*

Forms	North lat	East long	"Incomplete" nights									"Complete" nights										
			Local mean time in hours																			
			22	23	24	1	2	3	4	5	6	18	20	22	23	24	1	2	3	4	5	6
	°	°																				
Glows	75 1	159 5	7	12	11	10	17	14	17	8	12	0	0	3	12	12	12	18	12	18	3	6
	73 6	172 2	5	13	11	19	13	6	11	1	13	0	0	9	19	19	19	19	5	9	0	23
	70 7	162 4	8		11	11	11	5	9	3	6	0	0	7		4	11	9	7	9	4	9
Arches	75 1	159 5	23	18	20	12	16	18	14	13	8	21	18	24	15	24	15	30	15	15	18	12
	73 6	172 2	23	18	15	17	18	17	15	4	9	9	19	14	19	5	28	28	19	28	5	5
	70 7	162 4	35		26	26	30	27	27	18	9	11	13	32		29	24	33	29	33	24	13
Curtains	75 1	159 5	35	42	48	37	34	16	11	3	0	3	6	33	33	45	39	45	12	6	6	0
	73 6	172 2	32	24	43	29	34	19	5	5	1	14	14	32	14	37	28	37	23	9	9	0
	70 7	162 4	3		18	14	15	3	3	2	2	2	7	4		18	15	20	2	0	2	2
Streamers	75 1	159 5	10	13	14	9	18	9	6	4	1	0	0	9	9	9	9	9	9	6	3	0
	73 6	172 2	5	4	5	15	13	6	9	8	4	0	5	5	5	14	19	23	5	19	19	9
	70 7	612 4	3		0	2	3	2	2	2	2	0	2	4		0	2	4	2	2	2	2

(c) *Variation during the night in the frequency of various forms*—It is of interest to examine whether the variation of the frequency of the aurora as a whole is the same for all forms For this purpose Table 81 was prepared similarly to Table 80 The meaning is, for instance, that on seven per cent of all clear nights glows were observed at 22^h in latitude 75°1, basing the computation on observations on "incomplete" nights, or on three per cent, basing the computation on the results from "complete" nights In the table the observations of streamers and coronas are placed in one group

From Table 81 it appears that the curtains show a very marked variation of the frequency during the night with maximum between 22^h and 2^h The variation of the other forms is generally of the same type, but it is noteworthy that glows were not present during the early hours of the night, while arches are relatively numerous then The

variation in the frequency of the various forms appears to be independent of latitude. However, it is characteristic that the frequency of the arches is greatest at the southerly station, while the curtains here are far less frequent The lack of curtains at this station is evidently responsible for the much smaller range in the variation of frequency as a whole, as previously noted (p. 501).

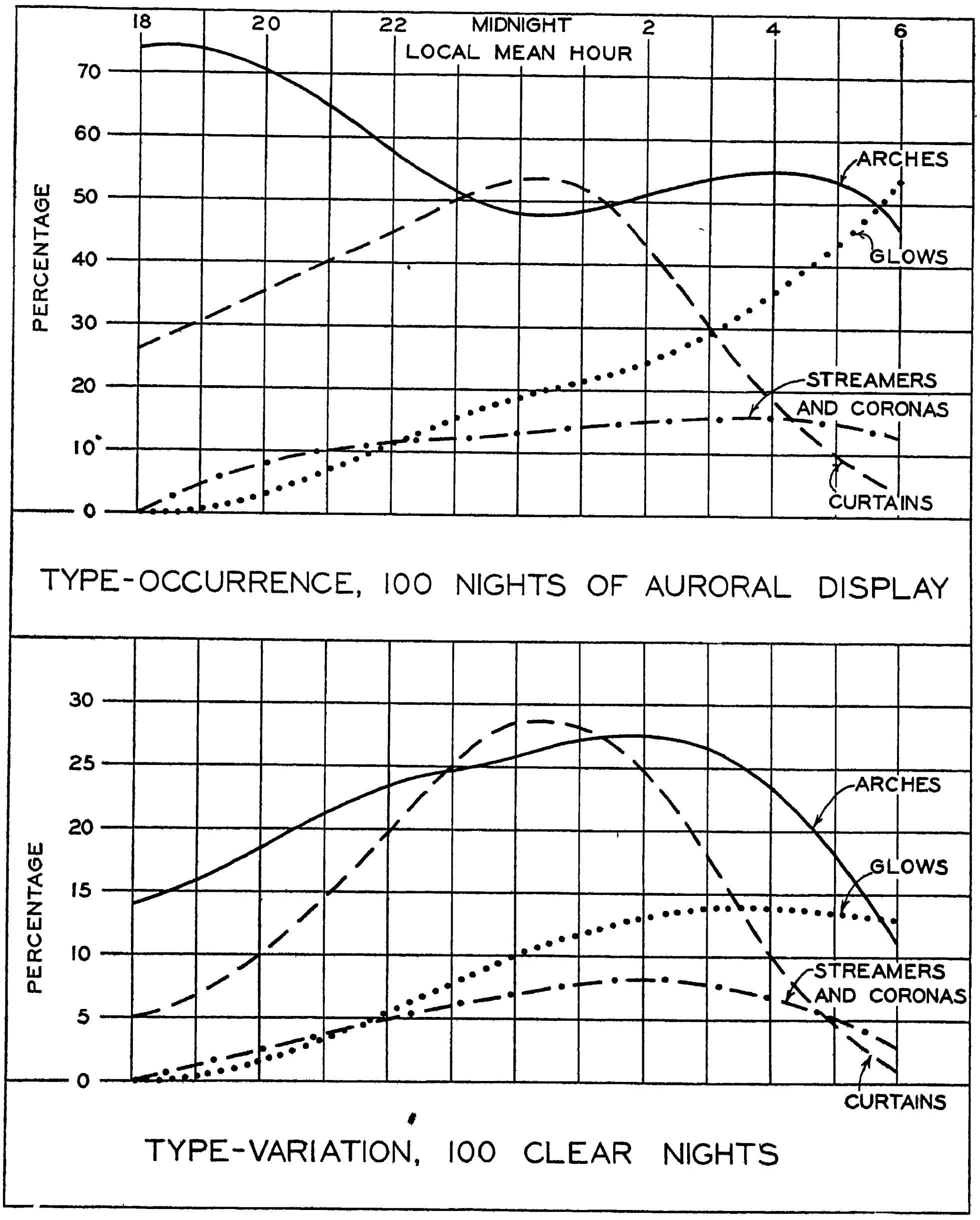


FIG 40—Type-occurrence and type-variation of aurora off Siberian coast
[Smoothed means — $(a + 2b + c)/4$]

Since the variation appears to be independent of latitude, a clearer picture may be obtained by combining the observations from all locations, utilizing the observations on the even hours only The results are represented by Table 82 and Figure 40. The table shows that at midnight a glow was observed on 10 of 100 clear nights, an arch on 22 of 100 clear nights, and so on. From the table and the figure it is clearly seen that

the occurrence of curtains is subject to a very great variation during the night, with maximum between 24^h and 2^h. The occurrence of arches and of streamers and coronas shows a similar but smaller variation, while the glows are most frequent in the later part of the night.

TABLE 82—*Variation during the Night of the Percentage-Frequency of the Various Forms of the Aurora (Mean of all)*

Form	Local mean time in hours						
	18	20	22	24	2	4	6
Glows	0	0	6	10	14	14	13
Arches	14	16	28	22	31	26	11
Curtains	5	8	20	31	32	4	1
Streamers and coronas	0	2	6	6	10	7	3

The percentage-occurrence of the various forms, that is, the number of cases in which aurora of a given form was noted when aurora was seen, is also of interest The variation in the percentage-occurrence during the night is the same at all stations and, therefore, it is sufficient to give the mean results for all These are given in Table 83 and represented graphically in Figure 40 The numbers in the table mean, for example, that in 100 cases when auroras were observed at midnight, glows were seen 20 times, arches 43 times, and so on We find that glows were relatively dominant in the later part of the night, arches in the early part, curtains had a maximum of percentage-occurrence at midnight, while streamers and coronas occurred in about the same proportion throughout the night.

TABLE 83—*Percentage-Occurrence of the Various Forms of the Aurora (Mean of All)*

Form	Local mean time in hours						
	18	20	22	24	2	4	6
Glows	0	0	12	20	22	33	54
Arches	74	76	56	43	50	62	46
Curtains	26	38	40	61	51	10	4
Streamers and coronas	0	10	12	12	16	17	13

Table 83 and Figure 40 give a good idea of the general character of the course of an auroral display. It begins in the late afternoon with an arch and perhaps a few curtains. Between 20^h and 22^h the display increases in intensity, curtains become more frequent, and streamers and glows appear. Around midnight the display is most brilliant and the moving forms predominate These disappear in the later part of the night, and in the early morning hours we frequently find only a glow or an arch left This description of a display is very generalized, a single display may have a widely different course

(*d*) *Movement over the sky*—Table 84 shows the percentage-occurrence of the aurora within the five sky-segments previously defined for every hour of the night The table shows, for example, that in 75°1 north latitude 86 of 100 auroras were seen in the segment called east at 22^h, and so on The fact that the sum of every column far exceeds 100 means that the auroras generally covered a number of segments A close inspection of these tables reveals that at the two northerly locations the aurora shifted toward the south during the night The percentage-occurrence in the northern sky decreased during the night, while the occurrences in the zenith and south increased No perceptible shift from east to west was found, though the occurrence in the east shows for latitude 73°6 a

small decrease during the night At the southerly station no general movement during the night can be detected

TABLE 84—*Percentage Occurrence Within the Five Sky-Segments*

Position	Sky-segments	Local mean time in hours										
		18	20	22	23	24	1	2	3	4	5	6
75°1 N 159 5 E	"Incomplete" nights											
	N			86	83	75	75	62	72	69	45	44
	E			94	87	82	79	68	75	84	85	78
	S			32	47	45	35	36	52	66	65	44
	W			76	81	72	73	66	80	84	65	50
	Z			36	49	38	40	36	35	34	40	56
	"Complete" nights											
	N	88	100	82	83	95	83	71	54	62	44	50
	E	75	100	88	83	100	67	75	62	85	89	100
	S	0	38	41	56	62	28	42	54	46	56	67
	W	75	100	65	83	90	61	71	92	69	67	83
	Z	12	0	35	56	38	33	33	31	46	44	67
73 6 N 172 2 E	"Incomplete" nights											
	N			84	67	69	75	67	59	78	36	53
	E			93	89	90	75	73	76	74	73	67
	S			26	14	24	34	38	31	39	45	47
	W			70	75	67	77	69	86	74	73	73
	Z			40	44	48	45	44	38	57	64	27
	"Complete" nights											
	N	60	100	92	56	90	62	73	75	90	25	67
	E	60	100	92	78	100	77	73	62	80	75	67
	S	20	57	25	11	30	46	40	62	50	25	33
	W	60	100	92	67	70	77	73	100	80	75	50
	Z	20	43	42	41	40	54	47	12	60	100	33
70 7 N 162 4 E	"Incomplete" nights											
	N			89	73	83	86	94	87	92	93	100
	E			82	73	90	93	81	78	80	93	83
	S			7	9	17	10	3	17	12	13	8
	W			75	64	83	79	75	74	76	87	75
	Z			11	18	17	21	19	13	20	13	17
	"Complete" nights											
	N	83	100	86	100	85	100	100	88	89	71	83
	E	83	100	76	78	90	100	87	88	84	71	67
	S	17	17	5	0	5	11	4	18	11	7	8
	W	83	100	67	67	80	89	83	82	84	64	67
	Z	17	33	10	11	10	22	30	24	32	7	17

These conclusions are best seen from Table 85, showing the differences between the percentage-occurrence in north and south and those in east and west, as based on data for "complete" and "incomplete" nights.

(*e*) *Variation of characteristics of arches*—Table 86 contains the total number of arches observed at every bihourly interval from 18^h to 6^h, with the mean altitudes and azimuths of summit and the corresponding values for the two six-hour intervals 18^h to 24^h and 0^h to 6^h No importance can be attributed to the apparent variation of the number of arches during the night, because observations, as already stated, were taken less frequently before 22^h and, in latitude 70°7, also for the interval 22^h to 24^h However, the other characteristics of the arches show remarkable features The altitude of the summit increased at the two northerly locations constantly from 18^h to 6^h so that at the most northerly location the arches on the average appeared in the southern sky after 2^h The increase was somewhat smaller on the second northerly than at the most northerly station, while at the southerly station there was, on the contrary, a small

TABLE 85—*Differences in Percentage-Occurrence*

Position		Local mean time in hours													
Lat north	Long east	18	20	22	24	2	4	6	18	20	22	24	2	4	6
		Difference, north minus south							Difference, east minus west						
°	°														
75 1	159 5	(88)	(62)	51	31	27	7	−4	(0)	(0)	20	9	2	4	25
73 6	172 2	(40)	(43)	60	48	30	40	14	(0)	(0)	18	25	3	0	0
70 7	162 4	(66)	(83)	82	72	92	80	84	(0)	(0)	9	8	6	2	4

decrease This result is in good agreement with the fact that the aurora, as a whole, appeared to shift during the night toward the south at the two northerly locations, but that no such shift could be detected at the southerly It may also be noted that the altitude decreased from north to south for all time-intervals except between 18^h and 20^h

The azimuth of the summit changes in a remarkable way At all locations it turned counter-clockwise during the night at the rate of approximately 1 degree per hour The fact that this systematic turning was found at all three locations is a strong evidence that the feature was real and not due to errors of observation

TABLE 86—*Altitudes and Azimuths of Summit of Arches Observed Between Stated Hours*

Position		Local mean time in hours																							
Lat north	Long east	18–20	20–22	22–24	0–2	2–4	4–6	18–24	0–6	18–20	20–22	22–24	0–2	2–4	4–6	18–24	0–6	18–20	20–22	22–24	0–2	2–4	4–6	18–24	0–6
		Number of arches								Altitudes of summit								Azimuths of summit							
°	°									°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
75 1	159 5	16	41	73	67	52	44	130	163	27	73	70	86	96	106	65 3	94 3	188	189	185	184	178	178	187	180
73 6	172 2	13	42	72	70	61	26	127	157	38	54	70	76	83	89	61 5	81 4	203	189	184	186	181	178	188	183
70 7	162 4	19	42	18	49	38	19	79	106	39	19	30	24	22	20	26 5	22 4	183	188	184	183	177	179	186	180

C Stormer, in his report of 1913, draws especial attention to a case in which the mean directions to the end-points of an arch which were observed throughout the night turned counter-clockwise during the night [5] Further confirmation of this phenomenon would be of great value

(*f*) *Periodicity of the aurora corresponding to the period of rotation of the Sun*—It is well known that a brilliant aurora is frequently followed by another one about four

[5] C STORMER Expédition d'aurores boréales de 1913 Geof Publ, vol I, No 5, p 129, Oslo 1921

weeks later, corresponding to the period of one solar rotation Fritz found 27.68 days as the length of this period In order to determine whether our observations gave any indication of a period about this length, the following procedure was adopted. In Table 71, showing the auroral character-numbers on clear nights, all days with character-number 20 or more were sought and named zero-days The character-number on the twenty-sixth day was, if present, entered on a form together with the number on the corresponding zero day, when the twenty-sixth day had been cloudy, both were omitted In the same way a series of corresponding zero-days and twenty-seventh days were found, and so on From these data corresponding values of the character-number on a number of zero-days and twenty-sixth days, zero-days and twenty-seventh days, and so on, were computed The mean character-number on the zero-days would vary slightly from group to group, because in many cases observations were available for only one of the days between the twenty-sixth and the thirtieth, and this variation was found to be too small to have any appreciable influence on the result In the same way the days with character-number 9 or less were sought and corresponding values for the character-number on the following twenty-sixth to thirtieth days found The result of this investigation is represented in Table 87 and the smoothed means $(a+2b+c)/(4)$ in Figure 41.

TABLE 87—*Auroral Character-Number on the 26th to 30th Day after Days with Unusually Large or Unusually Small Character-Number*

Auroral character zero-day	Character-number for zero-day and days following					
	0	26	27	28	29	30
Strong	23 0	12 3	13 9	15 3	12 3	12 4
Weak	4 0	7 7	7 2	6 8	7 2	8 8

It is seen that a strong display was followed by relatively strong displays in the whole interval between the twenty-sixth and thirtieth days after, while a weak display was followed by a number of relatively weak displays, and that the strongest and weakest auroras in this interval occur about the twenty-eighth day However, the display was strong also on the twenty-seventh day, thus this study indicates a period of the aurora which is somewhat shorter than 28 days, perhaps 27 8 days. This result is in excellent agreement with the period of 27 7 days found by Fritz

Attention may here be drawn to the results obtained by W. J. Peters and C C. Ennis[6] (see also Fig 41) regarding a possible periodicity of earth-currents corresponding to the period of rotation of the Sun These investigations found well-established evidence for a period of 27 days, which is almost 1 day shorter than the period here found for the aurora Whether this discrepancy is a real feature or results from insufficient data is a question the answer to which must await the accumulation of more data

SUMMARY OF THE RESULTS

The results of the discussion of the auroral observations on the *Maud* Expedition in the years 1922–1925 may be briefly summarized as follows

The zone of maximum auroral frequency for the years 1922 to 1925 and in longitude 160° east of Greenwich was found to be approximately between latitudes 77° and 78° north Near this zone, in 75° north latitude, auroras were observed on 9 out of 10 clear nights from October to March, but 6° to 7° to the south of the maximum zone, in 70°7 north latitude, auroras were observed on less than 7 out of 10 clear nights Farther south the aurora occurred more and more seldom in the southern sky Near the maxi-

[6] *Terr Mag*, vol 31 (June 1926), pp. 57-70.

mum zone the moving forms predominated, but farther south the quiet forms became predominant and in 70°7 north latitude the most frequent form of aurora was a low arch in the northern sky The average direction of the arches was found in all latitudes to be nearly perpendicular to the direction of the magnetic meridian, but the average altitude from the horizon to the summit of the arch decreased rapidly with decreasing latitude The radiation-points of the coronas were found to be under and to the west of the magnetic zenith.

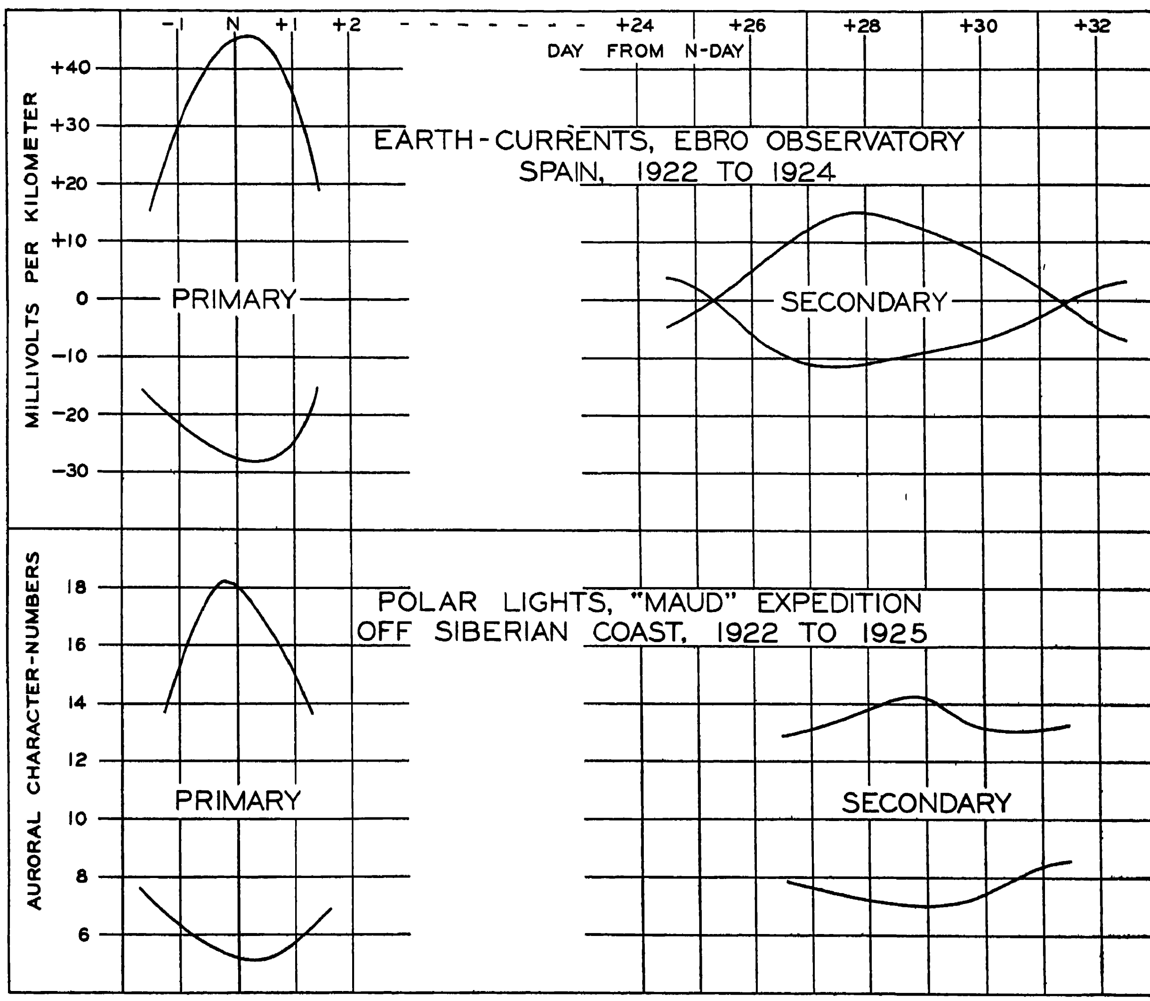


FIG 41—Auroras off Siberian coast, 1922-25, and 27-day recurrency earth-currents at Ebro Observatory, 1922-24 [Smoothed means — $(a + 2b + c)/4$]

Near the maximum zone no systematic variation from month to month could be found in frequency during October to March, but in latitude 70°7 north the frequency showed a decided maximum around midwinter Evidence was found for all three winters of the existence of a period in the intensity of auroral displays of between 27 5 and 28 days, corresponding approximately to the period of rotation of the Sun

The frequency of the aurora varied during the night and showed in all three mean latitudes a maximum between 22ʰ and 2ʰ, but the range of the variation decreased with decreasing latitude The variation was different for the different forms, the curtains showing the midnight maximum very well developed, the arches and streamers less, while the frequency of the glows was greatest in the latest hours of the night. The decrease

in the relative number of curtains with latitude accounts for the decrease in the range of the variation during the night, which was found when going southward Close to the maximum zone the aurora moves southward during the night, but in latitude 70°7 north no such movement was detected In agreement with this it was found that near the maximum zone the mean altitude to the summit of arches increased during the night, but farther to the south it showed a tendency to decrease. The direction of the arches turned counter-clockwise during the night from 18^h to 6^h; this turning was apparently independent of the latitude and amounts to about one degree an hour

It would be of great interest to compare a number of these results with corresponding ones from other regions, but such a comparison would go far beyond the scope of the present publication

Part VI—NARRATIVE OF THE EXPEDITION, 1918–1925

By H U Sverdrup

Expedition of 1918–1921

The "*Maud* Expedition" left Norway in July 1918 with a total personnel of ten men Captain Amundsen's plan was to follow the Russian and Siberian coasts eastward to about 165° east longitude, to penetrate as far north as possible in this longitude, let his vessel, the *Maud*, which was especially built for this expedition, freeze in there, and then let the vessel be carried by the drifting ice across the Polar Sea until it was released from the grip of the ice between Spitzbergen and Greenland, where the vast ice-masses from the Arctic are drifting slowly south to the Atlantic Ocean The main object of the Expedition was to study the physical conditions of the Arctic Ocean, but along with the oceanographic work a number of other observations of interest to geophysics were to be carried out; these included, among others, meteorological, aerological, and magnetic observations Most of the observational work was intrusted to the writer, but Captain Amundsen himself planned to make the magnetic observations

The magnetic instruments (see pp 315 to 316) were supplied by the Department of Terrestrial Magnetism and consisted of theodolite-magnetometer 8 and dip circle 205 The accessory equipment included observing-tents, a good assortment of tools and materials for repairs, forms, computing tables, books, complete instructions for the manipulation of the instruments, and general directions for the magnetic work This equipment arrived in Christiania at the beginning of June 1918 in perfect condition In addition to the above-mentioned instruments, the Expedition had also a land dip circle by Dover (No 154) and a photographic registering declinometer by Max Toepfer and Son In the drifting ice it is not possible to use photographic registering instruments, on account of the continual movements of the ice, but the declinometer was taken along for possible use in case the Expedition should be forced by circumstances to winter somewhere on the coast. On account of the war, a stock of new photographic paper for this instrument could not be obtained and, therefore, an old stock procured in 1913 had to be used

The equipment included also three sextants, five theodolites of different sizes, three chronometers, and fifteen watches, of which three were supplied by the Department of Terrestrial Magnetism

The *Maud* left Vardo, Norway, July 18, 1918 Ice was met a few days after, but it did not form any considerable obstacle before Jugor Strait, which is the southern entrance to the Kara Sea, was reached The Strait was filled up with ice, and the *Maud* had to stay at the western entrance until August 17. During this period two magnetic stations were occupied, one on Vaigach Island on the north side of the Strait, and the other at the small Russian trading-place Khabarowa on the south side The last-mentioned station is the one which was occupied by Scott-Hansen on Fridtjof Nansen's north-polar expedition in 1893.

After going through Jugor Strait, the *Maud* met with heavy ice in the Kara Sea and was delayed so long that Dickson Island, north of the Yenisei River, was not reached until August 31 A supply of crude oil was take on board here, and during this work magnetic observations were carried out. As a steamer with supplies for the wireless station on Dickson Island was expected daily, copies of the magnetic observations were left there, to be sent to the Director of the Department of Terrestrial Magnetism They were received January 2, 1919, and the results are published in Volume IV of the "Researches of the Department of Terrestrial Magnetism" (The results are also included in the tabulation in this report, see pp. 332 to 336.)

The *Maud* left Dickson Island September 4, 1918, but again encountered great ice-masses September 6, west of Nordenskiold Archipelago. The *Maud* succeeded, however, in passing through the Archipelago, in rounding Cape Chelyuskin, the north point of the continent, and in proceeding about 25 miles farther east, but here the progress of the vessel was absolutely stopped by the ice September 13 There was no harbor, so the *Maud* had to anchor in an open bay about 200 meters from the shore-line. New ice formed rapidly The *Maud* was frozen fast in a few days, and preparations for the winter had to be made. Although this would mean a prolongation of the Expedition for at least one year, it was generally greeted with enthusiasm, because a wintering here would afford opportunity to carry out a number of investigations in a place hardly touched by former expeditions

Captain Amundsen selected at once a place for a magnetic observatory close to the shore-line, under a small hill. The wooden building (see p 372) was started about September 20, and October 1 it was so far ready that the first observations were taken in it

As stated above, it was Captain Amundsen's intention to make the magnetic observations himself, but on September 30, when the magnetic observatory was ready for use, he had the misfortune to fall and break his right arm close to the shoulder The magnetic observations up to the end of November were made, therefore, by the writer, at which time Captain Amundsen was able to take over a part and, later, all of them

It may be mentioned that systematic observations of the northern lights were not carried out, because there was no regular night-watch. Every display of northern lights between 8^h and 22^h was, however, noted Only a few photographs of the aurora were taken, mostly as experiments, because it was necessary to save the plates for regions farther north It may also be mentioned that attempts were made to measure the potential gradient of the atmospheric-electric field and the conductivity of the air, but the equipment secured during the war was not satisfactory, the main reason being that satisfactory insulation could not be maintained. The atmospheric-electric observations, therefore, had to be given up for the years 1918 to 1921.

During April and May 1919 a number of journeys with dog sledges were planned in order to explore the most northerly peninsula of the continent. Hanssen and Wisting were to undertake the longest trips, and they therefore received, during February and March, instructions from the writer in making magnetic observations with the dip circle Wisting especially showed himself an able observer, and he was for that reason intrusted with carrying out the magnetic observations on the sledge-journeys Hanssen and Wisting were out on two sledge-journeys. On the first they were away 23 days, following the coast west and southward for about 150 statute miles and returning the same way On the second, they at first followed their old route, then crossed overland from the west to the east coast of the peninsula and came back on the twenty-sixth day after a round trip of 352 statute miles Wisting had then observed at nine stations along the coast or inland, the average distance between the stations being about 45 miles. The observations on the journey in April were made under very trying conditions, as they had to be carried out in the open air at low temperatures, a snow-wall affording the only protection against the wind Unfortunately, the observations comprise only inclination and total intensity and not declination, because neither observer was sufficiently familiar with the necessary astronomical observations

At the end of April a party of four was sent to Crown Prince Alexei Islands, lying 40 miles north of the *Maud's* winter-quarters. They observed the inclination at two stations with dip circle 154.

Early in the spring of 1919 Captain Amundsen resolved to send home by way of Dickson Island all observations obtained during the first wintering. He hoped that the

ice-conditions would permit him to begin the drift in 1919, and thought it would be best to let two men take the results of that year's work to civilization as soon as possible, mainly because the observations might be lost if the *Maud* were crushed in the ice For that reason, in the middle of August all the observations were packed in three packages and sewed up in oilcloth One of the packages, containing all original magnetic observations and registrations, information necessary for the computations, maps, and sketches, was addressed to the Director of the Department of Terrestrial Magnetism. A notebook was kept on board in which all the magnetic observations had been copied The observations were condensed as much as possible in order that they might all be entered in a small book of practically no weight which could easily be taken along in case the ship had to be abandoned. No copies were made of the registrations, and no attempt had been made to tabulate hourly values from them

After a hard struggle against the ice, the *Maud* was able to leave the first winter-quarters September 12, 1919. The two men, Tessem and Knudsen, who had been selected to take back the observations, were left behind. They had built a house on shore, and were equipped with tent, sledge, five dogs, provisions and fuel for about one year, rifles, ammunition, maps of the coast, compasses, watch, and theodolite. They were instructed to start, if possible, for Dickson Island in the fall as soon as the ice was trustworthy, but if in their own judgment it was not advisable to go during the fall, then to wait until the next spring. Between Cape Chelyuskin and Dickson Island, three caches with supplies of provisions and fuel had been laid out in 1915, and the greatest distance between any two caches was only 250 miles The plan seemed perfectly safe, and, in addition, both men were experienced in arctic traveling and were good hunters. However, they failed to reach Port Dickson A searching expedition, sent out by the Norwegian Government in 1920, brought no information as to their fate, but in 1922 a Russian Expedition found the body of Tessem At some distance from the place where the body was discovered, a cache was found, where Tessem had deposited his belongings and the packages which had been intrusted to him The cache had evidently been visited by wild animals, because the packages and Tessem's belongings were scattered all over a small mound and one package was torn to pieces. The package which had been addressed to the Director of the Department of Terrestrial Magnetism was, however, undisturbed It was forwarded, together with other relics, to the Norwegian Government and was received by the Director of the Department of Terrestrial Magnetism through the Norwegian Minister in Washington, Mr H H. Bryn, March 31, 1923.

It soon became apparent that it would not have been necessary to send Tessem and Knudsen home, because the *Maud* did not succeed in penetrating the drifting ice of the Polar Sea, as hoped In the vicinity of Cape Chelyuskin and across Nordenskiold Sea, the *Maud* met much more ice than earlier expeditions have encountered in the same season, and on the east side of the New Siberian Islands there was only a narrow lead of open water between the heavy pack-ice and the coast. An attempt to penetrate to the north here soon had to be given up, and under these conditions nothing was left but to seek new winter-quarters on the coast. Captain Amundsen resolved to go to Chaun Bay, but when Ayon Island was reached, at the entrance of the bay, further progress was absolutely blocked by the ice. A strip of old ice 2 miles broad was found along the coast. The *Maud* was forced in some hundred yards among the old ice-floes, where she stayed perfectly safe during the whole winter.

When the Expedition came to Ayon Island, a number of natives of the Chukchi tribe were living there. These natives are reindeer nomads who spend the winters in the timbered inland, but the summers on the coast. It was soon noticed that they were so primitive that it would be of interest to learn as much as possible about their customs. For that reason, on Captain Amundsen's suggestion, the writer went with the natives

when they left the coast and stayed among them for seven and one-half months until they came back to the coast the following spring Besides making notes of ethnological interest, the writer carried out magnetic observations inland, using theodolite-magnetometer 8 with tripod, Dover dip circle 154, a small astronomical theodolite (Hildebrandt, Freiburg, 4474), and an observing-tent The time before the departure was so short and so much had to be done to provide for the different observations which were to be taken on board during the winter that no time was left for magnetic observations

It was rather trying to travel with the natives, because they moved so slowly They took two months to cover the 170 miles from the coast to the inland where they stayed during the winter On the days when they were moving, most of the time till noon was consumed in preparations, taking down the tent, lashing the sledges, and catching the reindeer, they were then able to cover 8 to 10 miles, but generally much less It often happened that, after spending hours and hours in getting ready, they stopped after the first mile

In this season conditions were very unfavorable for observations The daylight was short, and much bad weather made astronomical observations impossible Observations were made, therefore, at only one station, but no astronomical observations could be secured From the end of December 1919 to the beginning of March 1920 the natives lived in the same place, and magnetic observations were usually secured once a week, but the low temperature in the observing-tent sometimes was a hindrance The observations with the dip circle once had to be interrupted because frost formed so rapidly on the agate bearings of the dip needle that the movement of the needle was not free a moment after it was placed on the agate planes

At the end of March 1920 a number of natives were going to the yearly market at the Russian settlement Panteleika, close to the Kolyma River, to exchange their furs for tobacco and tea The distance was about 100 miles, and most of the natives did not travel with all their belongings, as they did when they moved with their reindeer herd, but used only their small personal sledges drawn by two reindeer, by means of which they were able to cover the distance in two to three days. The writer was anxious to go with them, partly in order to see the Russian settlement and partly in order to extend the magnetic observations as far west as possible, but it was difficult to transport the instruments under the circumstances After some trouble a sledge with two deer was obtained for the instruments, but it was necessary to leave the instrument trunk-cases behind to reduce the weight The settlement was reached without mishap, and two sets of magnetic observations were made there.

On the way back the reindeer which were pulling the sledge with the instruments were worn out and on the verge of breaking down A stop was made at a Chukchi tent halfway between Panteleika and the winter-station to wait for families who were coming with tents and all belongings to join the group with which the writer had spent the winter The interruption was utilized for making magnetic and astronomical observations The Chukchi group already on the way back to the coast was rejoined by the end of April Two more stations were then occupied The conditions were at that time very favorable for observations, there was continuous daylight and very often brilliant sunshine during the day, the temperature in the tent rising several degrees above the freezing-point The writer left the natives May 15, 1920, and, traveling by dog-sledge, reached the *Maud* May 17. Magnetic and astronomical observations had been made at five stations at an average distance apart of about 50 miles A station on Ayon Island was occupied in the middle of June.

During the writer's absence, Wisting had made several observations with dip circle 205 on the ice a short distance from the *Maud.* On December 1, 1919, Hanssen and Wisting left the vessel with two dog-teams. Their instructions were to reach the

nearest wireless station either at Nome or Anadyr, to send information about the Expedition, and to secure new equipment of different kinds to be sent to Nome, where Captain Amundsen had decided to call in July 1920 Among the telegrams which were to be sent was one to the Director of the Department of Terrestrial Magnetism in which Captain Amundsen asked for two pairs of intensity-needles for dip circle 205, because one pair seemed to have been damaged in some way during the inevitably rough transportation on the sledge-journeys at Cape Chelyuskin Wisting was also instructed to carry out on this journey magnetic observations along the coast with dip circle 205 and to occupy stations at an average distance apart of about 50 miles Travel along the coast in midwinter was extremely hard, and Wisting had the same experience as the author, namely, conditions very unfavorable for carrying out magnetic observations while traveling in this season Wisting and Hanssen reached Cape Deschnew (East Cape) at Bering Strait early in February From here Hanssen proceeded alone to Anadyr, where, through the courtesy of the Russian officials and officials in the United States, he succeeded in sending the telegrams, including the one to the Director of the Department of Terrestrial Magnetism, who received it March 29, 1920 In the meantime, Wisting stayed with a trader living in the native village of Kain-ge-skon at the south entrance to Bering Strait At this point he made a number of magnetic observations in a snow-hut, which he built for that purpose Hanssen returned from Anadyr in the middle of May, and together they covered the 700 miles from Bering Strait to the *Maud* in 28 days During the last 14 days traveling was very difficult, because the snow had melted on the land and they had to keep on solid sea-ice At the mouths of the numerous rivers the sea-ice was often covered with fresh water to a distance of several miles from the shore, and they had to make great detours to avoid the water In some places it could not be avoided, and they were forced to walk miles in water almost knee-deep In spite of the short time and the hardships incident to fast traveling, Wisting carried out his instructions completely He observed at eleven stations along the coast, the average distance between them being about 60 miles, and he brought the instrument back in perfect condition However, his observations were, as before, restricted to inclination and total intensity

The *Maud* left Ayon Island July 6 and anchored at Nome July 27, 1920 Here the Expedition learned that no news had been received in Norway of Tessem and Knudsen The copy of the magnetic observations for the winter 1918 to 1919, together with all the original observations for the next winter and copies of the astronomical and meteorological observations as far as they were of importance for computations, was therefore sent to the Director of the Department of Terrestrial Magnetism, who received them September 22, 1920. While at Nome, a package was received from the Department of Terrestrial Magnetism containing two pairs of intensity-needles for dip circle 205, in compliance with Captain Amundsen's wireless request from Anadyr

After a short stay, the *Maud* again left for the Arctic August 8, 1920, to make a third attempt to penetrate the large drifting ice-fields of the north The attempt failed once more Even in Bering Strait heavy ice was encountered and it was only with great difficulty that Cape Serdze Kamen, 70 miles west of the Strait, was reached Further progress was absolutely impossible, and accordingly winter-quarters for 1920 to 1921 were established at Cape Serdze Kamen In the last struggle against the ice the propeller was broken and the shaft was damaged. The following summer (1921) it was necessary to proceed to Seattle for repairs to the vessel

Before departing from Nome, the personnel of the Expedition was reduced to four, four having left at Nome because the Expedition would last several years more than anyone thought when the start was made in 1918 This had, of course, an influence upon the scientific work, which also was hampered by the severe weather conditions during the

first part of the winter. The ice broke up close to the shore several times in October and November, and it was not until the end of November that the *Maud* was frozen fast At the end of November a snow-hut, where a few observations were made, was built on the shore north of the vessel. Captain Amundsen himself acted as cook and was for that reason prevented from observing. During a severe 14-days' snow-storm in the first part of December, the snow-hut was buried by the drifting snow and the roof was broken down Fortunately the instruments had been removed as soon as the storm started During January 1921 a number of observations were made in an observing-tent, which was set up on a low mound close to the shore west of the *Maud*

On January 31 the writer and Wisting left the *Maud* with two dog-teams to follow the coast to Holy Cross Bay, thence if possible to Anadyr, and on the return to cross overland from Holy Cross to Kolutchin Bay The object was to make magnetic observations and to collect information of ethnological interest The instrumental outfit consisted of dip circle 205, theodolite 4474, and two watches The coast followed has a very bad reputation among traders and natives on account of numerous blizzards, the east and south coasts of Chukotsk Peninsula are in this respect much worse than the north coast.

The party was absent from the *Maud* 69 days and covered 1,200 miles, but on 23 of the days could not proceed on account of blizzards An attempt to cross overland from Holy Cross Bay to Kolutchin Bay failed The snow was so deep and soft that the daily travel was very small, and the party had to turn back owing to scarcity of dog-feed During February and March magnetic observations were made at eleven stations, but on account of the bad weather astronomical observations could be secured at only a few of the stations

After the return, the writer took a short trip to Pitlekai, a native village about 50 miles west of the winter-quarters, where A. E Nordenskiold had made magnetic observations during the *Vega's* wintering in 1878 to 1879 A wooden pole driven into the ground had marked the place of his observations, but according to the natives nothing was now left of this pole. An old woman, who remembered the *Vega*, however, indicated the approximate place where Nordenskiold's ice-house had stood, and the tent was set up there and a series of observations was made with dip circle 205. The magnetic observations of this winter were closed on April 26, 1921, by simultaneous observations with magnetometer 8 and dip circle 205 at Cape Serdze Kamen

The *Maud* left her winter-quarters July 1, 1921, and reached Seattle August 31 Since it was Captain Amundsen's intention to start out again in 1922 and try once more to get into the drifting ice, the *Maud* was overhauled in Seattle, and equipped again for a number of years. While these repairs were in progress the writer took the magnetometer and the two dip circles to Washington, where they were compared with the standards of the Department of Terrestrial Magnetism He reported at Washington in the latter part of October 1921 and continued there until March 1922

In April 1922 he returned to Seattle, taking with him the same instruments which previously had been used by the Expedition. In addition, the Department of Terrestrial Magnetism had also provided instruments for measuring atmospheric-electric potential-gradient, consisting of two electrometers, four ionium-collectors, collector-posts, wall-insulators, batteries, and accessories

EXPEDITION OF 1922–1925

The *Maud* left Seattle again June 3, 1922, sailing for Nome, Alaska, where Captain Amundsen himself joined the Expedition He intended to leave the *Maud* again at Point Barrow, Alaska, accompanied by the aviator, Lieut O. Omdahl, in order to attempt a flight in a Junker all-metal airplane across the Arctic Sea to Spitzbergen After

having landed the party and the airplane, the *Maud* was to proceed to the vicinity of Wrangell Island under the command of Oscar Wisting, to be forced into the drift-ice and, if possible, to be carried by the drifting ice-fields across the Arctic Sea to the region north of Spitzbergen The drift was expected to take from three to five years and the time was to be devoted to scientific observations of interest to various branches of geophysics The program included magnetic observations, as on the previous cruise, and, as a new addition, observations of the atmospheric-electric potential-gradient, both to be taken in cooperation with the Department of Terrestrial Magnetism of the Carnegie Institution of Washington

From Nome the *Maud* crossed to East Cape (Kain-ge-skon) on the Siberian side of Bering Strait, where dogs and fur clothing were taken on board During the brief stay a magnetic station was occupied close to the station of 1920 and 1921 (see p 370) The *Maud* then returned to Alaska and remained for two weeks at Deering, Kotzebue Sound, the season being not far enough advanced for proceeding to Point Barrow Opportunity was taken to carry out magnetic observations The results of these and of the observations at East Cape were mailed to the Director of the Department of Terrestrial Magnetism in July 1922

While at Deering, Captain Amundsen decided not to take the *Maud* to Point Barrow, because this place, on account of the ice-conditions, probably could not be reached before the middle of August, thus leaving Captain Wisting too short a part of the "open season" for penetrating the drift-ice The Junker airplane, therefore, was transferred to a trading-schooner bound for Point Barrow and on July 28 Captain Amundsen and Lieutenant Omdahl went on board this vessel at Point Hope, Alaska On the same date the *Maud* proceeded toward the drift-ice

The party on board the *Maud* consisted of eight men Oscar Wisting, captain, H U Sverdrup, in charge of scientific work, G Olonkin, chief engineer, F Malmgren, assistant scientist, K Hansen, mate, S Syvertsen, second engineer, O Dahl, aviator, and Kakot, Siberian native, cabin-boy During the drift every man on board took part in the scientific work, which was greatly facilitated through Captain Wisting's interest and appreciation

The ice was met at a short distance from Point Hope, but Captain Wisting succeeded in penetrating to the vicinity of Herald Island, where the *Maud* was closed in by the ice August 8, 1922, in latitude 71° 16′ north and longitude 184° 54′ east We did not succeed in drifting across the Polar Sea, but on August 9, 1924, after two years, were released from the drift-ice in latitude 76° 15′ north and longitude 143° 12′ east, north of the New Siberian Islands

Our zig-zag drift was determined by frequent astronomical observations, the position being observed on 297 days during the period August 3, 1922, to August 8, 1924 The magnetic work began August 5, 1922, with observations of the inclination and the total intensity taken on the ice without any shelter During August and September several stations were occupied on the ice under the open sky, but unfortunately the number of observations in September was small, because the writer was ill for a short period and because the others were too busy with preparations for the winter to take part in the scientific work

The building of an observatory of ice, primarily for magnetic and atmospheric-electric observations, was begun October 2 and was completed October 9 It was built of ice-blocks about 18 inches thick, cemented together with water, and was covered with a roof of light canvas. At the entrance a frame for the door was frozen fast and a wooden door was fastened to the frame Copper or brass nails were used for all fastenings. Inside the ice-house a tripod, the legs of which were buried 6 inches in the ice, was placed for use during the magnetic observations.

Arrangements for observations of the atmospheric-electric potential-gradient were made in the northeast corner of the house Through the northwest corner three lead-covered cables connected to resistance-thermometers, which were buried in the ice 30 feet from the observatory, were brought in and connected to a switch This corner also was arranged for measurements of day and night sky-radiation It was ascertained that no parts of the permanent arrangements had any magnetic effect. The instruments for measuring ice-temperatures and radiation, however, were magnetic, for which reason the measurements could never be taken simultaneously with the magnetic observations. The ice-house was at a distance of 60 meters from the ship, beyond the influence of the magnetic iron masses on board

The canvas roof and the ice-walls of the house let so much light through that no artificial illumination was needed as long as the daylight prevailed, but electric light, supplied by current from storage-batteries on board the ship, was nevertheless installed at once No magnetic effect of lamps and leads could be detected

The difficulties which were caused by the movements of the ice and the precautionary measures taken to overcome them have been described in the discussion of methods of observation

From the end of October the magnetic observations were carried out as routine work Captain Wisting observed the inclination and the total intensity with the dip circle regularly twice a week, while Malmgren observed the declination with the magnetometer simultaneously with the writer taking astronomical observations for position and azimuth of mark The writer occasionally observed the horizontal intensity with the magnetometer at a few stations, simultaneously with observations of inclination and total intensity by Captain Wisting, and also took a few of the other observations

In November the conditions in the ice-house were improved by installing a non-magnetic "stove," partly to lessen the discomfort of the observer and partly to reduce the formation of frost on eye-pieces, verniers, pivots, and bearings The "stove" was a copper case inside of which a Primus stove was kept burning. It was placed in a corner of the house after it had been ascertained that no effect on the magnets could be detected even when brought close to the instruments The stove proved to be of great advantage, primarily because the air in the ice-house was kept dry

The atmospheric-electric work was begun October 14, 1922, and the daily observations of the potential, which were taken at about 10^h local mean time (L M T) were intrusted to G Olonkin, who had received the necessary instructions Our program included also observations of the potential gradient through 24 hours in order to determine the diurnal variation Olonkin, Malmgren, and the writer took these observations, dividing the 24 hours among them During the winter of 1922 to 1923, complete 24-hour series were secured on 18 days, but in several cases the attempted series had to be discontinued either because the wind-velocity became great enough to whirl the snow, covering the ice, up in the air, thus disturbing the conditions, or because the insulation could not be maintained on account of fog When the ice began melting in June the dampness of the air became so great that it was impossible to maintain a satisfactory insulation For this reason no atmospheric-electric observations were carried out in the summer months During the winter, observations had been taken simultaneously in the ice house and at a field station, situated on smooth ice, in order to determine the factor by means of which the potentials observed in the ice-house could be reduced to volts per meter.

Our immediate surroundings remained unchanged during the entire first winter, making it possible to follow the program which had been decided upon, without any breaks for more than six months, but in June 1923 our observatory gradually melted until on June 27 it broke down An observer's tent was erected on the ice July 3 for

use during magnetic observations. Captain Wisting made the tent spacious and convenient by omitting the central inside pole, using instead four long outside poles, lashed together 3.1 meters above the ground, and hoisting the top of the tent up under the point where the poles were lashed together.

From the middle of June until the end of the first week of July it became impracticable to observe the declination after the adopted method, because the snow covering the ice was melting so rapidly that the astronomical theodolite could not be kept level during the observations. The astronomical observations, therefore, had to be taken on board and observations of the declination were carried out on the ice, using the compass of the dip circle. In July the hard surface of the ice was exposed and it became possible to return to the old method, but even then the melting made leveling difficult. The number of observations was reduced on account of prevailing fog. The great humidity of the air threatened to cause damage to the dip needles by rusting. The needles had to be handled very carefully and had to be wiped and dried after each observation.

During the first three months of the drift we had been carried rapidly to the west, but in November and December 1922 we remained in practically the same position, which is evident from the accumulation of the magnetic stations in latitude 73° 15′ north and longitude 174° east (Fig. 9). From January to September 1923 we drifted mainly toward west-northwest, describing many circuits, and September 8 were in a favorable position, apparently on the point of crossing the drift-route of the *Jeannette*, 1879 to 1881, which until then we had paralleled on the southern side (Fig. 7). We hoped to cross this route, pass on the northern side of De Long Islands, and be carried across the Arctic Sea in a higher latitude than that reached by the *Fram* during Fridtjof Nansen's famous drift of 1893 to 1896.

We were, however, bitterly disappointed. Prevailing northerly winds carried us 100 miles to the south, and the winter of 1923 to 1924, from November to April was spent in latitude 75°.3 north and longitude 158° east, which is again evident from the large accumulation of the magnetic stations in that region (Fig. 10).

In the summer of 1923 we lost one of our comrades, S. Syvertsen, who died July 10 from inflammation of the brain. His body was buried in sailor's fashion, being lowered between the ice-floes.

During the summer the aviator, O. Dahl, had constructed a recording electrometer, which proved to be a highly valuable addition to our scientific equipment, because by means of this instrument we could obtain continuous records of the atmospheric-electric potential. The 24-hourly eye-observations had given such interesting results that we wanted to increase the amount of data as far as possible. However, as there were so few observers, we could not increase the number of 24-hour series without abbreviating other parts of our program, for which reason a recording instrument would be very desirable. The writer, therefore, asked Dahl to attempt the construction of a recording quadrant-electrometer. The instrument itself, which recorded the potential according to the same principle as the Benndorf electrometer, presented no difficulties other than those encountered when a perfect electrostatic insulation was to be insured. Amber is generally used for insulation, but we had no supply of amber. The difficulty was finally overcome by the sacrifice of an amber pipe-stem.

The recording electrometer was completed in September 1923, but several minor difficulties had still to be overcome, so it was not put into successful operation before October 1923. It was placed in an unheated room on deck, where it gave very satisfactory records until the beginning of May 1924, when the great dampness of the air again impaired the insulation. The instrument was attended to by the writer, while frequent eye-observations on smooth ice were taken by Olonkin in order to determine the reduction-factor.

At the beginning of the second winter, end of September 1923, a new ice-house was built, but as provision for measurements of radiation and registrations of the atmospheric-electric potential had been made on board, no arrangements for these observations were now necessary in the ice-house The leads from the ice-thermometers, which had been buried in a new place, were taken into the house as during the previous winter The new ice house, however, did not last very long During a tremendous ice-pressure October 28 the ice-floe in which the *Maud* had been lying solidly frozen fast for 13 months was crushed to pieces and the ice-house disappeared The ice-thermometers were lost, but the loss was not serious, because a spare set was at hand. A few days later the movement of the ice was repeated with still more violence and the *Maud* was subjected to a crucial test, which she stood splendidly She was not caught in the jam, but lifted out, because the ice could not get a hold on her round hull

On account of the unsettled conditions which followed, we decided to refrain from building a new ice-house, and to make the magnetic observations in the tent, which easily could be taken on board if the ice broke The ice-thermometer could be read under the open sky, thus the magnetic observations were the only ones for which a shelter on the ice was required, and for these the tent was entirely satisfactory in its new and more convenient form During the winter the ice actually broke close to the ship several times and the tent had to be taken on board, but no serious interruptions of the magnetic work occurred On two occasions cracks opened so rapidly that the tent could not be brought to safety and it undertook independent drift-expeditions, the floes on both sides of the crack being displaced relatively to each other On the last occasion we thought that the tent was lost The ice broke on Thursday afternoon, May 8, and the tent rapidly disappeared between hummocks and pressure-ridges Searching parties looked in vain for it on Friday and Saturday On the following Sunday, Mr Hansen, the mate, and the writer took a walk, following a lane covered with young ice on which walking was easy, and going in the direction opposite to the one in which the tent last had been seen Our surprise was great when we came across it at a distance of about 2 miles from the ship

In May and June only a few magnetic observations were made, because the ice was in such rapid moton and our immediate surroundings subject to such frequent changes that we had opportunity only occasionally to place the tent on a solid floe In July the conditions for magnetic work were still more unfavorable, the *Maud* being carried back and forth by rapid tidal currents in the shallow water north of the New Siberian Islands, where the ice had been piled up in fantastic pressure-ridges, remnants of which were grounded in 10 fathoms of water and between which the broken summer-ice was grinding and jamming Fortunately, the small spaces of open water, characteristic of this season, left the ice so much freedom that no violent pressures occurred, but in the fall or in the winter this region would have been extremely dangerous even to a ship like the *Maud* In July 1924 it was possible to make a few magnetic observations under the open sky on large ice-floes

On August 9, 1924, the *Maud* was so close to the edge of the drift-ice that we could work our way out and proceed under the vessel's own power after having been carried by the ice for two years. On February 17, 1924, Captain Wisting had received a wireless message from Captain Amundsen, requesting him to try to get out of the drift-ice and return through Bering Strait When released from the ice, we were near to the place where the *Fram* was closed in during 1893 and had we remained we would probably have repeated the drift of that vessel, spending three or perhaps four additional years in the drift-ice It is doubtful whether the increase of the scientific results would have been proportional to this long period and the inevitable mental strain Captain Wisting, however, had to follow Captain Amundsen's instructions and return through Bering Strait

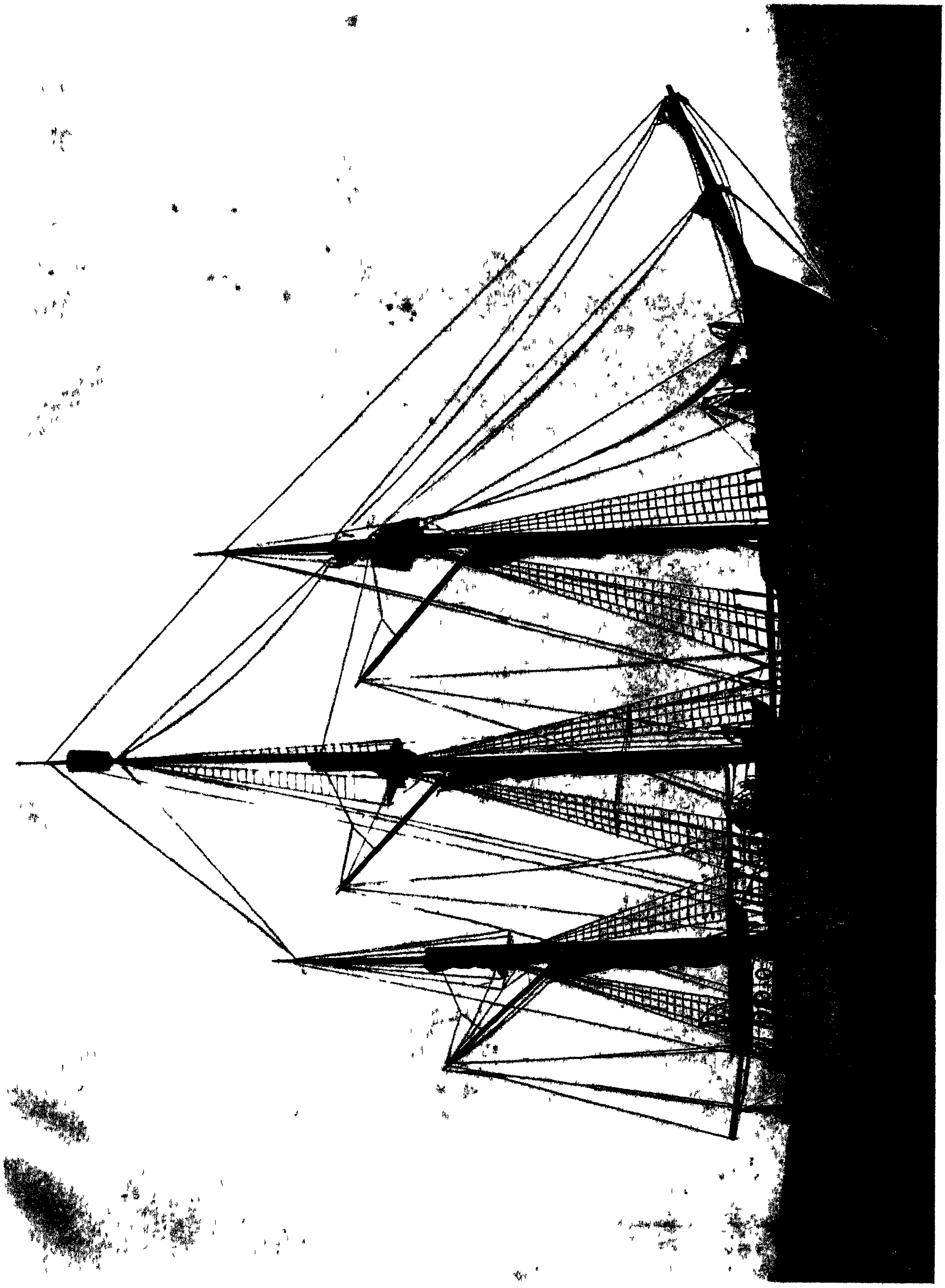
After an unsuccessful attempt to get around the eastern side of the New Siberian Islands, we had to turn around and follow the western side of these islands to the Siberian mainland After passing Laptew Strait, separating the New Siberian Islands from the mainland, we found ice lying close to the coast, but, after numerous delays and with considerable difficulty, we reached the bay off the Kolyma River August 28 Here every attempt to make progress was definitely stopped. No leads could be found, either close to the coast or at greater distances from shore, and, after a week of futile attempts, winter-quarters of comparative safety were sought close to Four Pillar Island of the Bear Island group We did not succeed, however, in getting closer than 5 miles to this small island, and on this account our position remained very much exposed We were afraid that the ice might break and the *Maud* might be carried off the coast, but fortunately only a few short displacements occurred in September and October

From October 20, 1924, until the beginning of July 1925 our surroundings remained so undisturbed that the conditions for magnetic work were practically the same as on solid ground. Therefore, at the end of November we installed our photographic recording declinometer in a light-tight case within a tent and thus obtained registrations of the magnetic declination for a period of almost 6 months, ending in the middle of May, when the melting of the ice threw the instrument out of level The ordinary magnetic observations presented no particular difficulties They were begun and ended with intercomparisons between the magnetometer and the dip circle

The atmospheric-electric potential was again recorded by means of the electrometer made by Dahl and the reduction-factor determined by eye-observations, which were made on smooth ice at a sufficient distance from the ship.

The ice broke around the *Maud* July 13, 1925, and progress toward Bering Strait was resumed We were now all longing to get out of the ice, because another winter on the coast would be very trying and would not add materially to the value of our scientific work The three weeks from July 13 to August 6, during which we were forcing our way through the ice or impatiently awaiting a change in the wind to scatter the ice, therefore, were filled with anxiety, hopes, and disappointments Finally, on August 6 we saw the last ice-floes disappear in the fog behind us and for the first time in more than three years we were sailing in open water. Our party now consisted of six men, our cabin-boy, Kakot, having left us on his native coast in Siberia, and all had to be sailors, every hand being needed for maneuvering the ship Previously every one had taken part in the scientific work Lack of lubricating oil caused a delay on the Siberian side of Bering Strait. Our cruise in the Arctic was ended when the *Maud* was lying peacefully anchored off Nome on August 22, 1925

In concluding this narrative the writer wishes to take opportunity to thank his comrades for their unfailing interest and enthusiastic cooperation, which made possible the accomplishment of the results represented in the preceding reports



THE "MAUD" AT NOME